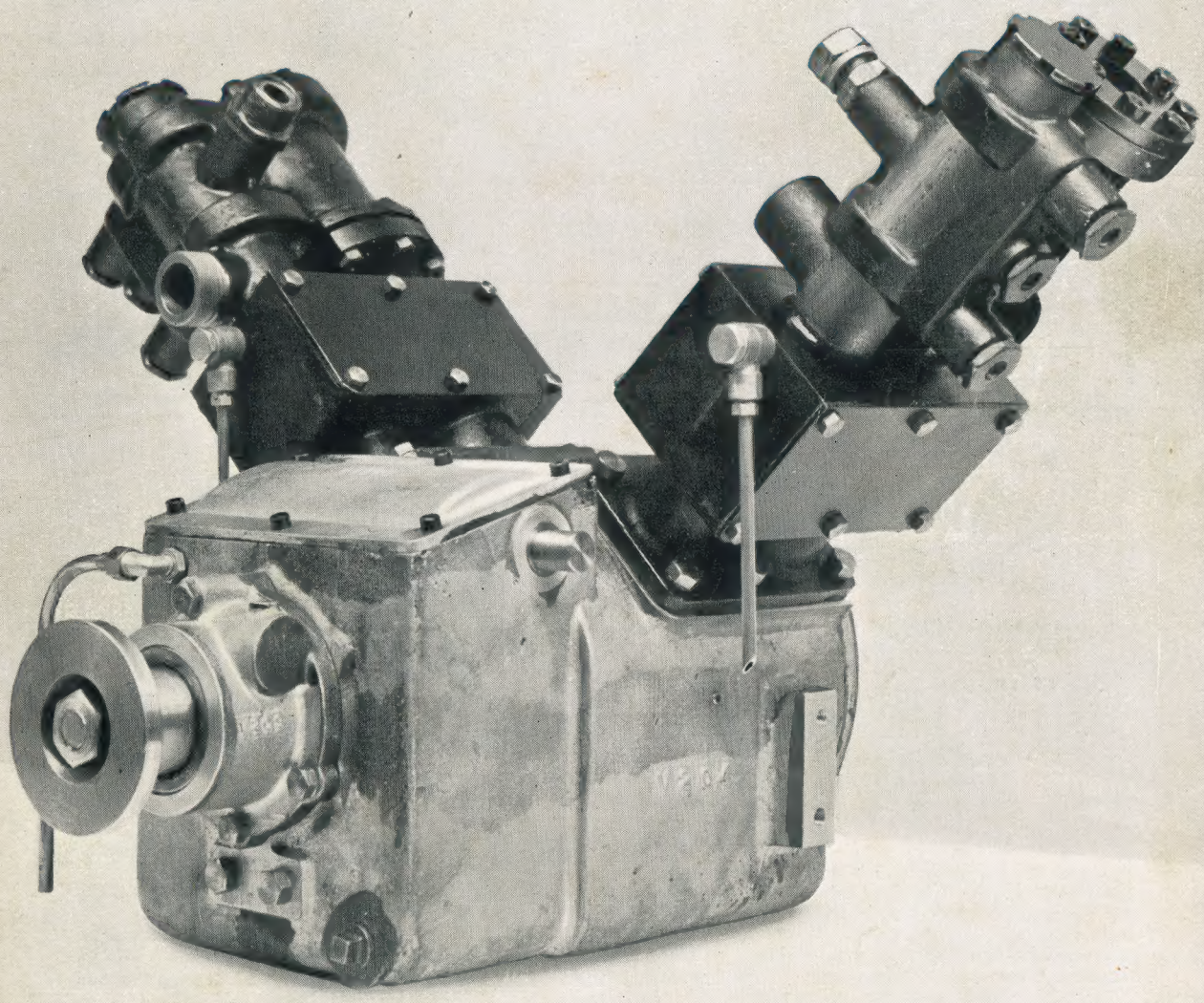
THE MODEL ENGINEER



IN THIS ISSUE

● A SIMPLE VALVE GEAR FOR FLASH STEAM ENGINES
MARINE MODELS AT THE NORTHERN MODELS EXHIBITION
● A SMALL WATCHMAKER'S LATHE ● L.B.S.C.'s LOBBY CHAT
AN AIR COMPRESSOR PLANT ● BORING IN THE LATHE

MAY 6th 1954
Vol. 110 No. 2763

9D

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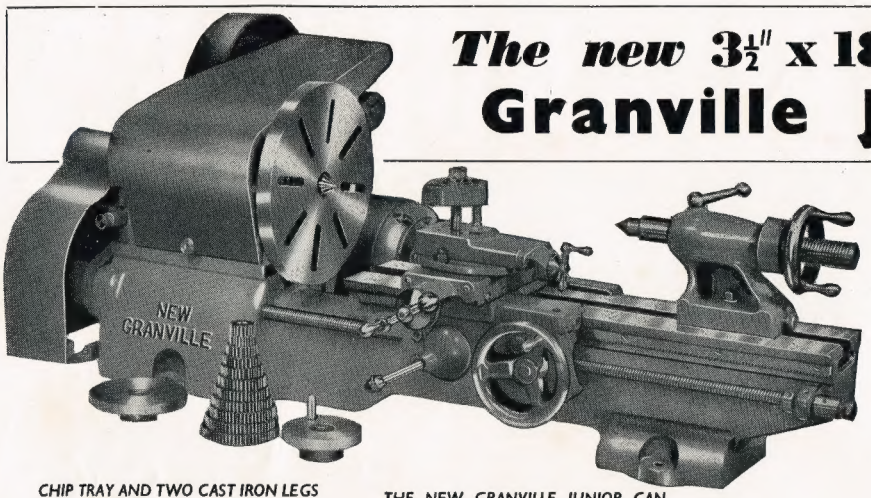

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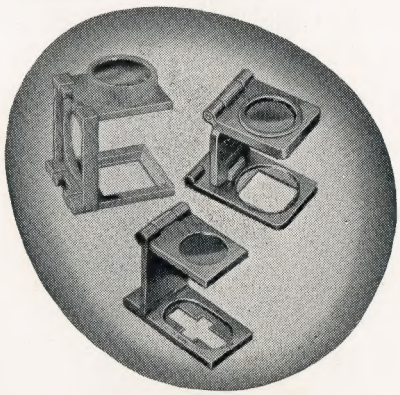

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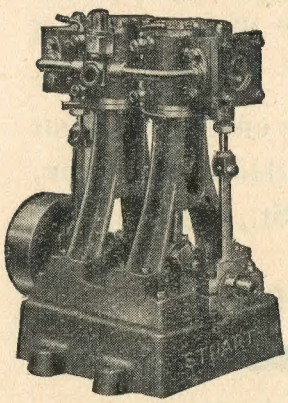

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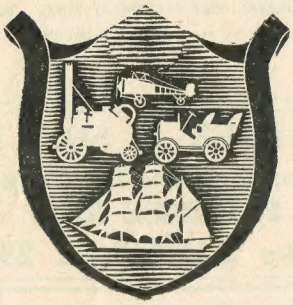

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1954

The Model Engineer

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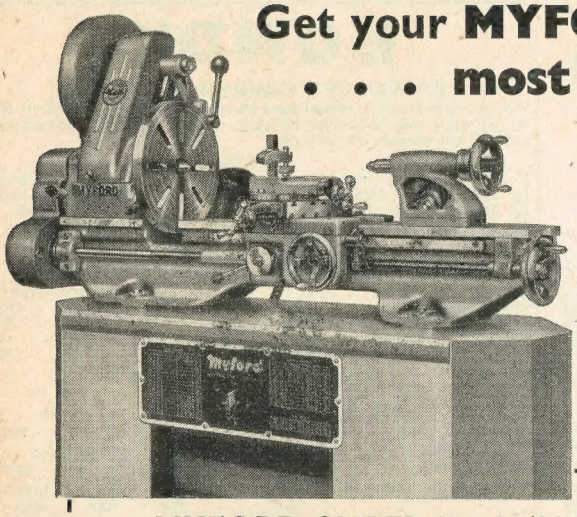

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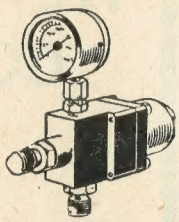

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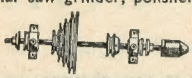

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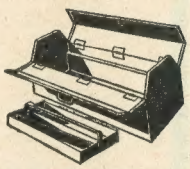

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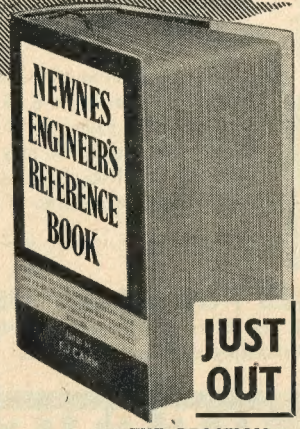

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THE MODEL ENGINEER

EVERY THURSDAY

Volume 110 - No. 2763

MAY 6th - 1954

ESTABLISHED 1898

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CONTENTS

SMOKE RINGS	483
MAKING THE MILITARY CRAFTSMAN	484
A SIMPLE VALVE GEAR FOR FLASH STEAM ENGINES	487
L.B.S.C.'s LOBBY CHAT My New Lathe on the Job	492
MARINE MODELS AT THE NORTHERN MODELS EXHIBITION	496
INDEXING DEVICE ON MANDREL	498
A VEE COMPOUND STEAM-CAR ENGINE	499
BUILDING A SMALL WATCHMAKER'S LATHE	500
THE FLAMEMASTER BRAZING TORCH	502
BORING IN THE LATHE	503
INTERNAL LAPPING OF BEARINGS	504
A ROTARY AIR COMPRESSOR PLANT	506
READERS' LETTERS	508
QUERIES AND REPLIES	510
WITH THE CLUBS	511

Our Cover Picture

The engine shown in this photograph is somewhat on the large side for construction in the average model workshop, as it has been designed and built for installation in a full-size steam car by Mr. Thos. Hindle, of Blackburn, whose early articles on steam plants for similar purposes will be remembered by many of our older readers. It is of the vee compound type, with the cylinders disposed at 90 degrees to each other, having a bore of 1¾ in. and 3 in. respectively and a stroke of 2 in., both connecting-rods work on a single crankpin. A single eccentric operates the two piston valves, and its effective throw and phase timing can be controlled to give full gear or varied cut-off in either direction. Further details and photographs of the engine are given in an article by Mr. Hindle elsewhere in this issue. In view of the keen interest displayed by many of our readers in steam car development, we feel sure that they will welcome this important contribution to research by one who has made practically a life study of light steam plant design.

SMOKE RINGS

The Model Railway Exhibition

THE ENTIRE arrangement of this finest of model railway exhibitions was different from all those previously put on by the Model Railway Club, at the Central Hall, Westminster ; it provided plenty of space for visitors without any curtailment of the number of stands, while the exhibits seemed to us to be more numerous than ever. The quality of the work was excellent in every department, and the predominence of new models was most satisfying. The interest in the pre-nationalisation and pre-grouping periods of British railways persists to a remarkable degree and is evident in something like 90 per cent. of the exhibits. A section was allocated, some few years back, to American railroads, and this has grown to a remarkable extent; but we did not notice many models of diesel locomotives there ! A working layout in a real garden was one of the features of the show. The ever-popular passenger-carrying track was kept busy throughout the time that the exhibition was open.

Popular Carriage

THE BRITISH Transport Commission has opened an exhibition in the Shareholders' Meeting Room, at Euston Station, to illustrate two centuries of carriage design for road and rail. It is open on weekdays from 10 a.m. to 7 p.m. and on Sundays from 2 p.m. to 7 p.m., until September 25th. By means of models, pictures and other means, the exhibition displays a large variety of vehicles that have been used for public and private conveyance on the roads and railways during the past 200 years. Obviously, very great changes have occurred at various times during such a lengthy period, but one remarkable impression, left by a careful inspection of the exhibits, is that the changes do not always appear to have been for the better; even our modern vehicles would not seem to compare very favourably with some that have been used in the meantime. This exhibition is certainly well worth a visit by anyone interested, in any way, in the development of the " popular carriage."

" The Coupling "

THE ABOVE is the title of the journal edited and published by and for the members of the Bedford Model Engineering Society. We have received a copy of the April issue and find its contents chatty, helpful and informative. The purely domestic notes reveal that the society is in thoroughly sound condition, so much so, in fact, that a 40-per-cent. *reduction* in the annual subscription is announced ! This indicates a laudable enterprise that might, perhaps, be studied and, where possible, emulated with advantage in many other quarters.

We regret to note that, early in March, the society's boathouse at Longholme was broken into, but some of the missing property has already been recovered. The locomotive track at Kempston is in process of being overhauled in readiness for the coming season's running which, this year, will be inaugurated at Whitsun.

Apart from such notes, articles on " Choosing a Power Boat Prototype," " Railways Around the County," and " Birth of a ' OO ' Tank Engine " are among the contents of this excellent little magazine.

Calling Greenford and District

ON SATURDAY, May 22nd, the First Greenford Boy Scouts will be holding a " Grand Fete and Summer Carnival," at Oldfield Lane, close to Greenford Station, at 2.30 p.m. Due to the collaboration of the S.M.E.E. Affiliation, some of the attractions will be of interest to readers of THE MODEL ENGINEER, and although the event, no doubt, will be widely advertised in Greenford, the advantages of modern transport should ensure that many readers from a wider area could visit it.

Making the Military Craftsman

Patching a rifle butt in the Armourer's shop

By J. Dewar McLintock

THE War Office devotes 36 pages of fairly comprehensive literature to the Army Apprentice and Boy Training Schemes in its book "The Way to a Fine Career," and it would be a waste of time for me to try to cover the same ground in a page or two, particularly as this publication and all particulars can be obtained from any recruiting office or from The War Office, (A.G. 10), London, S.W.1.

My main intention here is to give some kind of eye-witness account of a special visit which I made to Arborfield—one of the three schools—but I must first at least very briefly summarise what the Commandant told me about the schemes.

The three schools are at Arborfield, near Reading, Chepstow, Mon. and Harrogate, Yorks. A different set of trades is taught at each, but the schools are run on almost identical lines. Incidentally, anyone who wishes to visit a school can do so, after applying to the Commandant at one of those addresses.

Boys are admitted to the schools from the date on which they reach school-leaving age up to the age of 17. There is an entrance examination in English and mathematics and specimen papers which I have seen suggest that most school-leavers would pass without much difficulty.

The boy must, of course, enlist into the regular Army before he can join one of these schools, so that this is a scheme for the boy who has already decided upon the Army as a career. True, there are a few boys who "do not make the grade" and some whose parents buy them out for £20 after a little heartburning, but those are exceptions and are far from numerous.

In general, the schools take boys for a three-year course, which is divided into six terms. They receive basic military training and reasonable pay while they are learning a trade and—this is important—they continue their general education. Boys leave these schools as Class III tradesmen, and should go to Class II and Class I much more quickly than other young soldiers who want to be engineers. They are, in fact, already "the stuff of which N.C.O.s are made," before they leave the school.

Before we started our tour of the school, the Commandant explained to me that there is a strong intermingling of mechanical training, ordinary soldiering, education, and those many factors such as sport, welfare, hobbies, etc., which are so important to the adolescent. "We are not so very different from an ordinary school," he added, "and we have sporting fixtures against civilian schools." The present strength of the school is just over 800, but the ceiling is 1,000.

First I was taken to see what may be described as the amenities of the camp. Of these, the most important to the growing boy is probably the dining establishment! There are two adjoining dining halls, each accommodating 400 ravenous young men. It is no reflection on the boys' character, but rather an evidence of healthy enterprise, that at each serving table a man should check each individual against a list, so that he does not come round again! Personally, having seen the lunches on this occasion, I should have said that any normal person would have been very comfortably overfed with *one* helping of each course, but growing boys are evidently super-normal. Incidentally, there is an excellent choice of courses, which is something that I never experienced during my service, even in the officers' mess.

We looked in at a barrack room. The accommodation is not luxurious, but it is very "liveable" and each boy has his cupboards, etc., and a good bed and bed-space, and there is certainly no overcrowding. Incidentally, it was a very cold day when I visited the camp, but I was impressed with the adequacy of the heating in all quarters. There are pleasant recreation rooms, in one of which is a television set, and there are, of course, canteens for those lads who are *still* hungry.

Then we went to the shops, or at least to some of them, for in such a large establishment it would be impossible to see everything in one such visit. We started at the bottom of the ladder, just as the apprentice does, and put ourselves into an atmosphere of scribers, files, scrapers, etc., in the No. 1 fitters shop. The boys do all the usual things—the square, the triangle, dovetail, keyway and key, etc., and examples of their work are kept in a display cabinet to show visitors, some of whom, no doubt, wonder why such strange devices should be made at all! Some of the students who show good promise are allowed to make their own hand tools before very long, whilst the average student is able to take home a neat little matchbox stand after his first six months at the school. It should be understood that these youngsters,

although they may feel that they have done all the "hard graft" in the first six months, have to return to the humble fitter's bench at various later stages.

The machine shop is very spacious and astonishingly well equipped, so that no apprentice ever lacks elbow room, or is unable to concentrate on the work in hand because other fellows are cramping his style. I was shown many examples, first of simple turning, then of more complex efforts. In the former category were rods simply turned to three diameters, workpieces which were taper-turned, and those with internal and external radius, etc.

Before leaving the big machine shop, I noticed that there were two dusky-looking students at a magnificent new capstan lathe, and I learnt that these were Burmese boys, who would eventually return to the Burmese Army.

We went to the blacksmiths', tinsmiths' and general metalwork shop. Students were receiving all manner of interesting tuition, including manual forging, brazing, welding, and of course soldering—the latter being exemplified in a number of tin funnels lying on a bench, and probably awaiting transfer to the domestic quarters when opportunity served.

These boys are receiving instruction on carburation

Among the more ambitious efforts were examples of internal and external screw-cutting, a left-hand square thread, and right-hand vee-thread, etc., culminating in a magnificent sixth-term workpiece combining the various forms. It was in this shop, incidentally, that I saw the splendid 7¼ in. gauge scale model of the Royal Scot, which is somewhat remarkable in being of all-fabricated construction. Even the wheels are built up with individual spokes, etc. The locomotive is not designed for steam-power, more's the pity, but is driven, for display purposes, by means of an electric motor, compressed-air operation having proved somewhat costly.

So to the automobile engineering shop. It is not difficult to understand that there is fair concentration on, and enthusiasm for, this branch of engineering, bearing in mind the utter dependence of the modern armed forces on mechanised transport, and the fascination of motors to the average boy. We saw a number of classes at work round trestle tables, each class with a qualified instructor at its head. No class is bigger than 10 in strength. Since the tables are set up in the actual shop, and not in a separate section, it is an easy matter for the students to turn to practical work at any stage, or for the instructor to refer them to actual examples of what he is explaining. In each section, there are enough examples of whatever it may be—engines, gearboxes, axles, etc.—for each lad to "have a go at," and these various components must almost take themselves to pieces and put themselves together again, so often have they been dismantled!

All basic practices in motor engineering are covered, and it is a measure of the thoroughness of this training that part of the curriculum is for vehicle mechanic trainees to re-metal mains and big-ends. The subsequent in-line boring, and cylinder boring, are also subjects of instruction. The automobile shop is indeed well equipped, and almost like a miniature motor factory, or at least a service depot. There is a most comprehensive array of components of all kinds, and of course,

Basic fitters' training in progress at one of the schools

the appropriate tools needed for their servicing, etc. The work done, it must be understood, is entirely instructional, and none of the units is used on vehicles in normal service.

I was interested to see a number of small chassis, with axles, brake gear, etc. These were obviously too small to belong to any known army vehicle, and were, in fact, assemblies which had been made up for instructional purposes, and with a view to saving space, using up otherwise unserviceable parts, etc. Also included in the equipment of instruction were a Lucas electrical equipment demonstration assembly (which I recognised as a former Earls Court "showpiece"), and a beautiful sectioned working model of a Gardner diesel engine, in chrome and gleaming paintwork. All the theory and practice connected with the oil engine are of course included in the curriculum for those students who wish to become vehicle mechanics, and there is a typical diesel pump and injector servicing laboratory, of the usual, almost clinical cleanliness.

I was taken next to a shop where armourer apprentices were intensely busy. This, I was told, was the only shop where actual production work is done. That is to say, small arms, and company and battalion weapons such as the 2-in. and 3-in. mortar are thoroughly reconditioned and put back into service. It was indeed most fascinating to see the boys working on rifle furniture, for example, scraping it to the bare wood, and patching it where necessary, with the greatest skill and precision. This involves work of the expert cabinet-maker's standard.

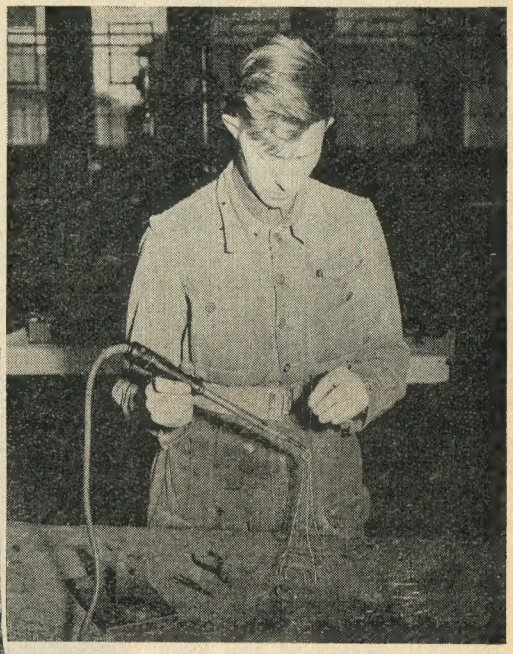
In the telecommunications shop there was an atmosphere of comparative calm—no noise, few boys, and a great many untenanted benches. This was because most of the students were at that particular time in various classrooms—of which there are many—studying higher theoretical aspects of their subject. There was plenty of equipment to be seen, however, as well as the traditional display cabinet, containing examples of the students' work. The latter included, somewhat unexpectedly, a number of pleasant little models of such objects as suspension bridges, the Eiffel Tower, a wheelbarrow, chairs and tables, etc.—but these were representative of beginners' skill in soldering wire! There were also complete radio sets, and it is worthy of note that students can make their own "receivers," which become their own undisputed property, as they pay for the components.

Among the components, I was particularly attracted by a "black board receiver." This comprises all the normal components of a radio set, mounted in appropriate positions behind a board which bears on its front a clear diagram of the circuit. The various electrodes are brought out to studs and plugs, so that voltages and currents are measurable on external meters—the rig being intended for instruction in fault-finding.

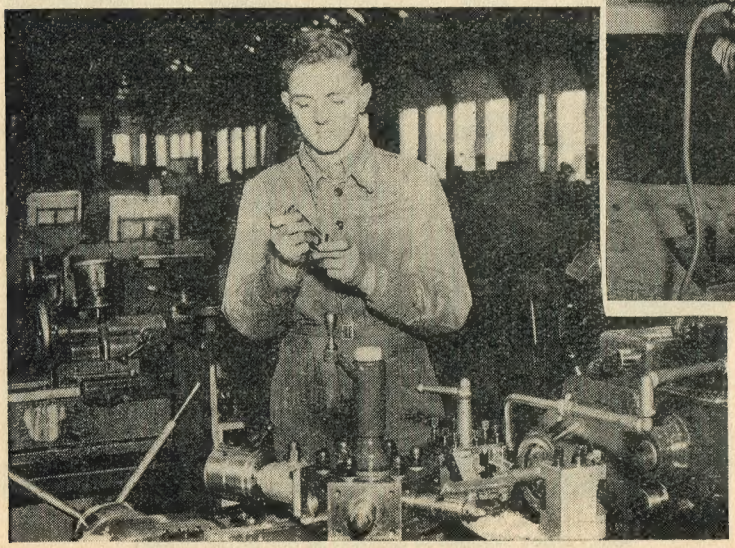
Electrical and electronic subjects gain daily in importance in the modern army, not merely on account of the universal employment of radio communication, but because of the inception of the guided missile as a factor in modern warfare. Incidentally, the students have a wireless club for off-parade pursuit of their vocation.

A brief visit was paid to the instrument training section, where a number of earnest young men were engaged on theory, optical tests, etc. This is advanced work, usually taken in the fifth and sixth terms, and the lads are working on calibration and tests of dialsights, telescopes, rangefinders and binoculars, etc., towards the end of the course. There is a separate instrument machine shop which would delight the heart of any model engineer, and its equipment includes

(*Continued on page* 491).

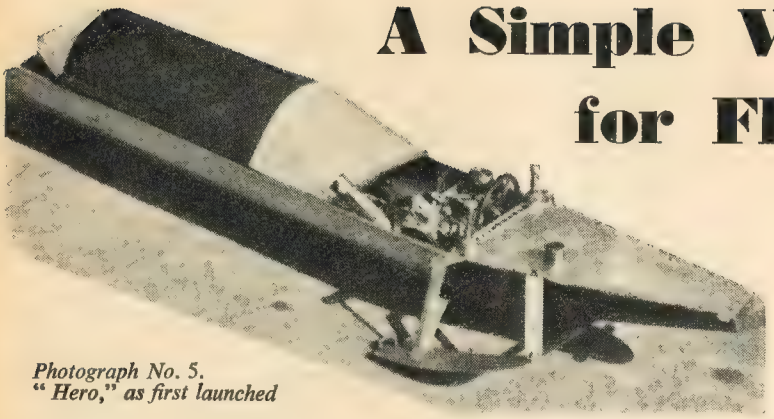


Soldering practice is made more attractive by model-making



Left—Showing one of the lads operating the capstan lathe

A Simple Valve Gear for Flash Steam Engines



Photograph No. 5.
" Hero," as first launched

By J. A. Bamford

AFTER a great deal of unproductive research on steam turbines, I was beginning to think that I would never get a flash steam boat running, so I resolved to cut my losses and build a piston engine of more or less conventional design. After having thought about it for a while, however, I was resolved to be unconventional after all. I therefore gave a great deal of thought to an alternative form of valve gear, which is about the only department left for individuality in a piston engine.

I remembered seeing an article on an engine driven by a soda-water syphon charging cylinder. The action was very similar to that of a steam engine, except that the gas entered the cylinder cold and absorbed heat from the atmosphere via fins on the cylinder. This, of course, only aided the expansion due to the pressure, which was probably several hundred pounds per square inch. The interesting part about the engine was, however, that it had a ball-valve in the cylinder-head that was knocked open by a projection on the piston. Fig. 1 shows the basic principle of this engine.

Stark Simplicity

It will be seen that the valve gear had been reduced to stark simplicity, a valuable property when dealing with a highly stressed engine. An even more valuable property is that it must take much less power to drive the valve gear than any other type having sliding surfaces.

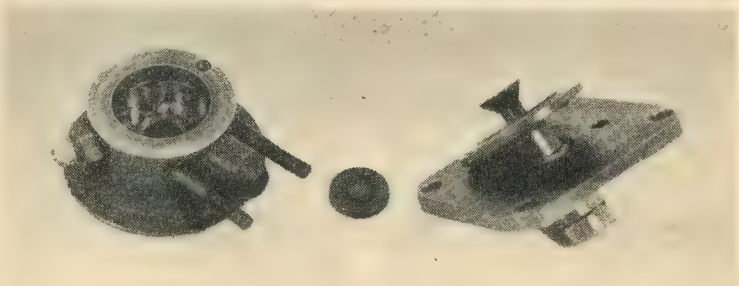
A convenient way of altering the expansion ratio is by altering the unswept volume of the cylinder head, and this can be done by using a cylinder-head gasket that project. more or less into the cylinder-head The expansion ratio can also be altered by altering the lift of the valve, but the restriction here is the amount of pre-admission that can be tolerated, as too much makes starting very difficult. Returning to the first method, it will be seen that if the head volume is 10 c.c. and the total swept, plus unswept, volume is 100 c.c., then the expansion ratio is ten to one, subject to the height of the exhaust ports. This is really equal to what would be called a cut-off, of 10 per cent. in a more conventional engine.

I mentioned my scheme to Mr. Jutton, who is a well-known steam exponent, and was somewhat taken aback to hear that he intended to try exactly the same idea. However, we both agreed to try it, but, where I was concerned, I had to build an engine, whereas he only had to make a new cylinder-head. I think this factor was an advantage, because I could design the engine accordingly, and as most people know, it is best to start from scratch when trying a new idea. I drew up a set of plans using my standard bore and stroke, i.e., $1\frac{1}{8}$ in. $\times$ $\frac{7}{8}$ in.; I have now made three engines of this size, and it certainly pays to do so, because rings, pistons, crankshaft, jigs and laps are all interchangeable. The valve took the form of a disc running in what looks like the inside of a splined coupling. Fig. 2 gives details of valve gear, and Photo. No. 1 shows the complete cylinder-head.

Work actually started two days before Christmas 1952, and by the end of the following week, the engine was complete enough for a steam test. The cylinder-head is made from nickel-steel, as was the original valve disc. The valve guide was made by drilling a ring of holes and finishing off with a " D " bit, afterwards turning away to the pitch diameter.

The original piston was made from cast-iron and had a duralumin centre to carry the gudgeon-pin, this being riveted to the cast-iron shell with rivets made from wire nails. The connecting-rod was of dural, with an uncaged ball-race for the big-end. The crankshaft was built up from nickel-steel, and is readily dismantled and assembled by placing a ground bar through two reamed holes in the webs. Photo. No. 2 shows crankshaft, connecting-rod and piston. The projection for operating the valve can be seen in Photo. No. 2.

The cylinder is of cast-iron, and



Photograph No. 1. Cylinder-head and disc valve

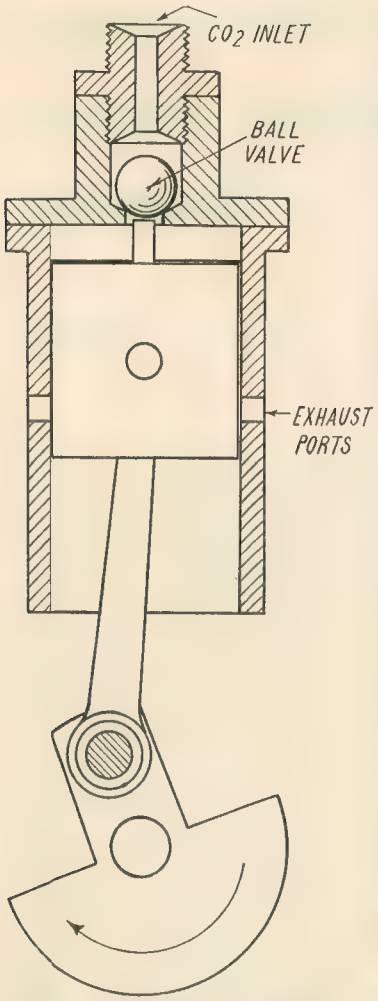


Fig. 1. Elementary CO_2 engine

has exhaust ports cut at the bottom of the stroke. These ports are the only means of exhausting the steam, so they were cut for the full 360 deg. The crankcase was cast up from scrap aluminium in a crude mould, and is of very simple design. Fig. 3 gives a general arrangement of the engine, and Photo. No. 3 shows the engine as first tested.

When first set up, the engine had the exhaust opening about 55 deg. before bottom dead centre, and the inlet opening about 20 deg. before top centre, and, of course, closing 20 deg. after top centre. The volume of the cylinder-head at top centre was 25 per cent. of the total swept volume, giving an expansion ratio of about 4 to 1, depending on the exact height of the exhaust ports. This could be altered by putting rings in the cylinder-head so that they occupied part of the unswept volume.

The engine was first tested on my small water brake, as used for the original turbine tests. Steam was provided by the original flash boiler, consisting of 20 ft. of ¼ in. diameter steel tube fired by twin blowlamps. The first test was done with both boiler and blowlamps fed by small hand pumps, so that I could desist if anything went wrong.

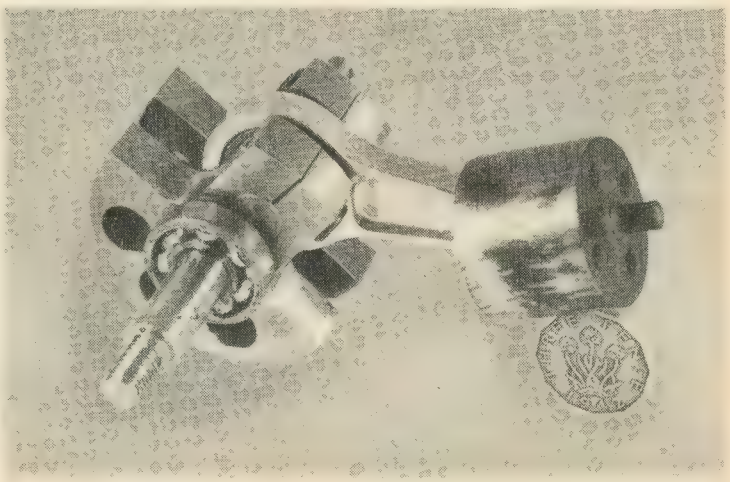
I fired up and fed water gingerly in by the hand pump until the pressure gauge recorded 100 p.s.i. I then pulled the engine over with a cord, and after a couple of pulls, away it went at about 2,000 r.p.m. I then proceeded to work the two hand pumps as hard as possible, and succeeded in working it up to what sounded like umpteen thousand r.p.m.

I was well satisfied at this stage, and took the engine down to examine it. On removing the cylinder-head I was horrified to see that the stalk on top of the piston was rounded on top, rather like a much used cold chisel. Obviously something harder than cast-iron was called for, so I made a new piston from nickel-steel and tried again. On this run I pressed a friend into service to work the pumps, while I recorded r.p.m. and took brake measurements.

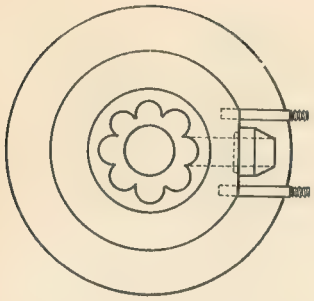
After a lot of frantic pumping I recorded 8,000 r.p.m. and 0.5 b.h.p. at a steady 250 p.s.i. steam pressure. Things were really looking promising, so I decided to rig up an engine-driven water pump, as the physical effort called for by manual operation is quite extraordinary. The engine was mounted between two plates at about 45 deg., so that it could be fitted to a semicircular hull, and a water pump was driven by an 8 : 1 reduction. Photo. No. 4 shows engine as mounted for the second stage tests. A lubricator of the Pilliner type was fitted at this stage.

I rigged the engine up on the brake again, and this time my friend only had to operate the fuel pump. Starting up, I again recorded 0.5 b.h.p. at 8,000 r.p.m., so my efforts at manual water feeding had not been in vain. I stripped the engine again at this stage and found that the disc-valve was split almost into two pieces; but the spike on the piston only showed a slight polishing. I made a new valve from S80, which is a stainless-steel of fairly good quality, and tried again. The engine was run for about two minutes at the same power output as before, and then stripped down for examination. I found that the new stainless-steel valve had split, and was almost in three pieces. I cast around for a piece of super steel and finally used a piece of a Norton motor-cycle exhaust valve. This was fitted, and has survived all further running of the plant, except for a slight pitting of the seat due to boiler scale becoming trapped.

After having got some measure of reliability into the valve, I decided to experiment with the clearance volume. I turned up a ring which fits inside the head, and thus reduces the unswept volume, this being held in place by a flange which



Photograph No. 2. Showing piston with valve spike



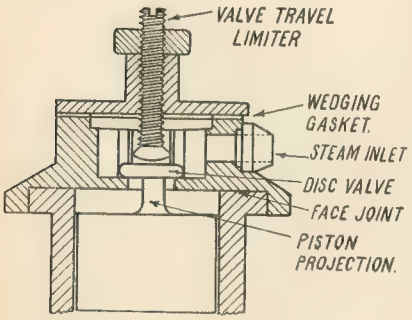
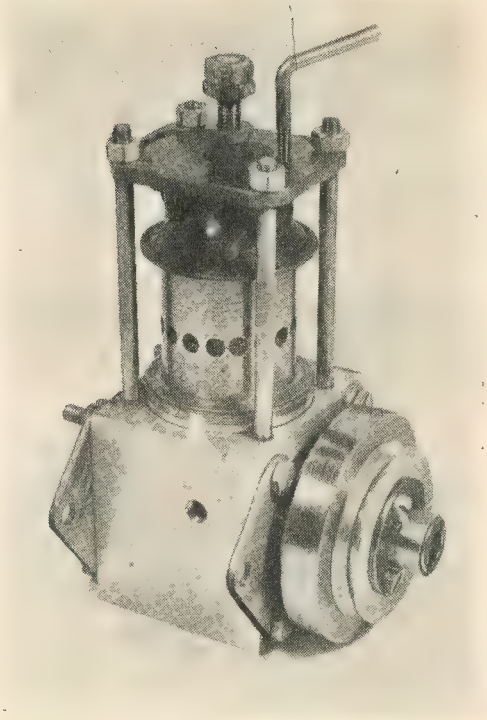


Fig. 2. Valve details



Photograph No. 3. Engine as first tested

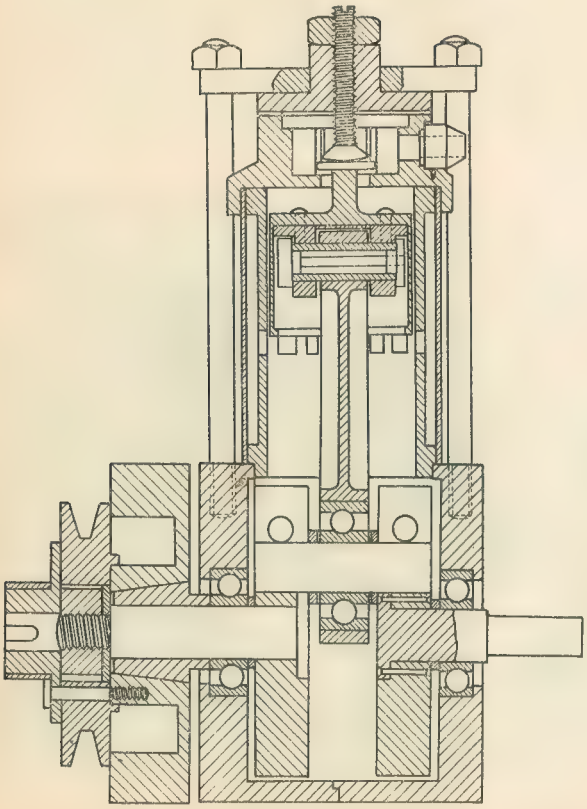


Fig. 3. General arrangement of engine, in section

acts as a cylinder-head gasket. I made this packing ring to round figures, and measured the change in head volume afterwards. The change was from a geometric expansion ratio of 5 : 1 to 5.7 : 1, and it had quite a startling effect. The engine was again run, using the mechanical water pump and hand fuel pump, the results being as follows, 1.2 b.h.p. at 8,000 r.p.m. and 400 p.s.i. steam pressure. The brake load was altered so that the maximum speed was again 8,000 r.p.m., as I did not want to break anything at this stage. The most interesting fact was that the water consumption came out at 20 lb. of steam per b.h.p. hour. This is a very good figure for a model-size engine, and not at all bad for a full-size non-condensing engine. The consumption may have been even lower, as I found a leaking union on the boiler feed pump.

The explanation for the sudden increase of power is, I believe, due to two things: One, the increase in expansion ratio made better use of the steam, and, two, the fact that the engine took in less steam per rev., while the pump put in the same amount of water, raised the boiler pressure. The increase in

expansion ratio would lower the mean effective pressure, but the increase in steam pressure more than compensated for this, and the m.e.p. was in fact raised. Another reason is that, as the boiler was working at a higher pressure, the water occupied more space as a liquid, and the heat transfer was thus raised, it being easier to get heat from metal to a liquid than from metal to steam.

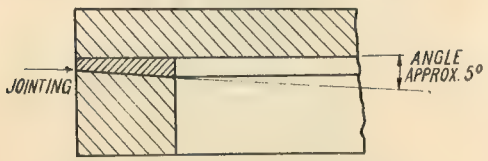


Fig. 4. Details of wedging gasket joint

Trouble Ahead

Obviously the next thing to do was to make a hull and fit a larger boiler, and thus I entered into the most interesting and trouble-filled era yet. In view of the lack of time, it being early summer, and well into the regatta season, I decided to make the hull from tinplate, and of a semicircular form. I had another reason for the use of metal, this being that as it was an experimental job, I expected many blow-ups, and fires in the wrong places; and I may add that I was not disappointed !

The engine was placed forward of the boiler to enable the propeller to be semi-submerged without having acute angles in the propeller shaft universal joints. The new boiler was similar to that used by Mr. Pilliner in *Frolic*, and consists of 30 ft. of $\frac{1}{4}$ in. diameter steel tube wound into four coils 2 in. o.d. and about 10 in. long. The first two coils are in series, and the last two in parallel to cut losses due to steam friction. Each coil was fired by a separate blowlamp, which was fed with vapour coming from a manifold to which was attached the vapouriser, this being fed by an engine-driven pump of $\frac{9}{16}$-in. bore and variable stroke. The stroke used in most tests was $\frac{9}{16}$ in. and the pump speed was approximately 1,200 r.p.m. The fuel tank was in the nose, and held over a pint of petrol.

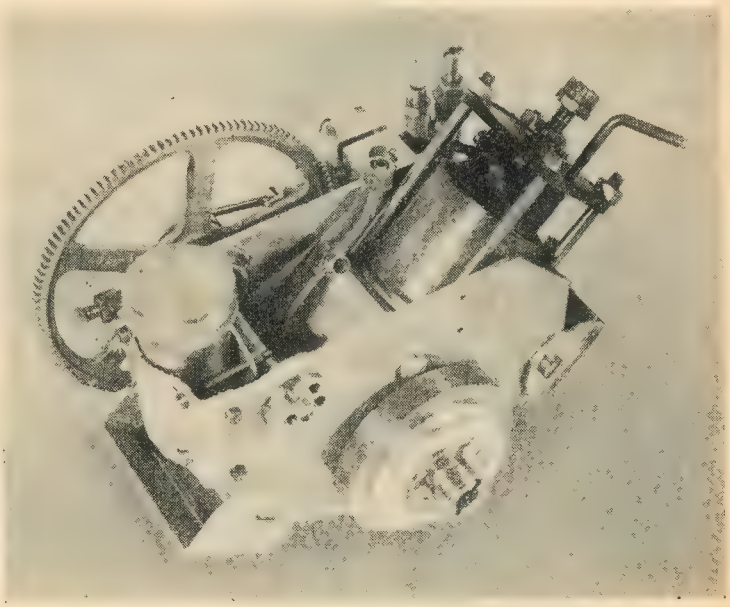
The hull seemed very buoyant when first tested in the domestic bath, but as the bits were added, it sank lower and lower, until, when the plant was complete, it had a bare half-inch of freeboard at the place that matters most, the bow. I could have rectified this by fitting hollow sponsons, but as the weight was already 15 lb. 15½ oz. I left it at that. I would like to point out, however, that little attempt was made to lighten components, and the boiler casing was made of oil drum metal. The boat was launched some three weeks after commencement, and is shown in Photo. No. 5 at the heading of this article, before it got its present battered look.

All the preliminary running of the plant was done by holding the boat stationary and altering pump throws and blowlamp details till good results were obtained. This is quite a long story, however, and I will endeavour to relate the blow-ups as they occurred.

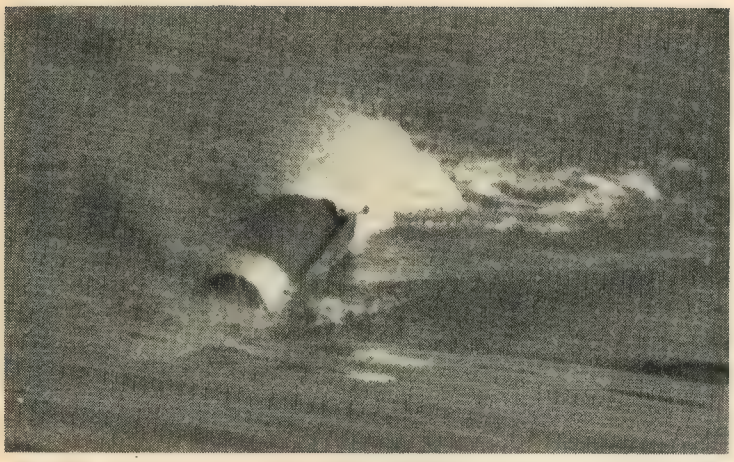
The first run ended in a seizure after about 15 sec., and on stripping the engine, I found the cylinder to be blue for over half its length and the cylinder-head to be blue all over. The piston (steel) and cylinder (cast-iron) were badly scored, so I lapped a couple of thou. out and tried again. Two more seizures were followed by two more lapping sessions, and at 7-thou. diametral clearance I had no more seizures. The next step was to work up the boiler feed pump until the steam started to go wet. I had worked up to $\frac{3}{4}$-in. stroke at $\frac{1}{4}$-in. bore when the cylinder-head started to blow, and try as I could it would not stay tight. It was here that I fitted a pressure gauge to the steam line, and found that when the head was blowing I had a pressure of over 1,000 p.s.i. I say "over" because my gauge only goes to 1,000, and the needle was hard against the stop; there may have been 2,000 for all I knew ! I finally cured the leak by fitting a head gasket, and machining the mating surfaces so that the gasket was forced into a "V" shaped gap. Fig. 4 gives details.

Having cured the leak, I returned to the water pump and increased the stroke to $\frac{7}{8}$ in. The first run at this setting folded up the pump ram like a banana, so I made a new one from solid stainless-steel. This also folded up. I next offset the axis of the pump to cut down the angularity of the connecting-rod and ram. This cured the trouble, but the next run found a new weakness. The delivery valvebox on the water pump blew off; it was silver-soldered on, and goodness knows what the steam pressure was.

I next made a very strong pump from solid dural, and to cut down the angularity due to the long stroke, I increased the bore to $\frac{5}{8}$ in. This seemed to have cured the trouble, so I began experimenting with the stroke again. I had worked up to $\frac{5}{8}$ in. stroke when the engine stopped, making very expensive noises. I stripped it down and found that the dural centre to the piston had softened and parted company from the piston. Fortunately, no other damage was done, so I made a new



Photograph No. 4. Engine with mechanical pump fitted



Photograph No. 6. Showing boat sinking at end of run

centre from steel and this has stood up well, except for being a beautiful shade of blue.

Down to the Pond

I now felt that it was time to try the boat round the pole, so down to the pond we went, and my troubles started all over again. The first time I pushed off, the lamp went out immediately, and down she went, bow first to the bottom. I realised that this would happen every time it came to rest as the following wave lifted the stern and the bow dipped under. After drying out and removing the shield in front of the boiler, I tried again. This time things went fairly well, and it toured round at about 30 m.p.h., but on coming to rest, slid gracefully beneath the waves, leaving a column of yellow flame behind it. A lot of fiddling with air intakes and pumps, jets and propellers, produced a max. lap speed of 40 m.p.h., at an average for the five laps of about 30 m.p.h. I ran it in regattas during 1953, mainly because I knew it would cause a lot of amusement when it sank with all hands and engines running, at the end of each race. I am greatly indebted to Mr. Pilliner for a delightful picture of it performing this last act. (See Photo. No. 6).

Analysing the Snags

I have not followed up this design for a variety of reasons; number one, I think is an aesthetic reason. A piston engine of such a size as to come within the limits of an "A" class boat and produce the 3 b.h.p. necessary is very highly stressed, and wears at a distressing rate. Another part of reason one is that the engine must be lubricated by steam oil, which covers everything in a thick black layer, and this means stripping the boat after every run.

The second reason is a technical one, and applies whether one likes steam oil or not.

For a steam engine of any type to be efficient, it must take steam at a high pressure and reject it at the lowest pressure possible in the circumstances. With my engine, which had a swept volume of 15 c.c. it would be necessary for the initial pressure to be extremely high to get the mean effective pressure to produce 3 b.h.p. Probably the pressure would be in the order of 2-3,000 p.s.i., and would thus be difficult to handle without piling on weight. The mean effective pressure could be achieved by using live steam for most of the stroke, but this would be very wasteful, and would reject as much energy as was used in the engine. For an engine with a high expansion ratio to be very powerful, it would have to be large, and in this particular case I think the minimum capacity would have to be about 50 c.c. I know of a four-cylinder version being built with a capacity of approximately 34 c.c., which is definitely in the right direction, and I eagerly await the finished article. In an engine of high expansion ratio, another form of loss occurs that is very difficult to avoid, this being the condensation of the steam due to the sudden expansion. This condensation takes heat from the cylinder walls, and the incoming steam has to make good that loss, to the detriment of its latent powers. This is the very reason why triple-expansion engines are used, namely to keep the range of expansion down and thus avoid condensation.

What is wanted is an engine that can take steam at the highest pressure that a flash boiler can muster, and this is in the order of 2,000 p.s.i. when thin-wall mild-steel tubing is used, and expand it down to atmosperic pressure in one stage. But that engine already exists; it is the turbine. As past readers will probably know, I have toyed with turbines for a few years, and at this stage I decided to fit my existing turbine in place of the piston engine and see what a real boiler would do for it. I hope to report my trials and results in this sphere at a later date, that is, if the K.B.P. is willing.

MAKING THE MILITARY CRAFTSMAN

(*Continued from page* 486)

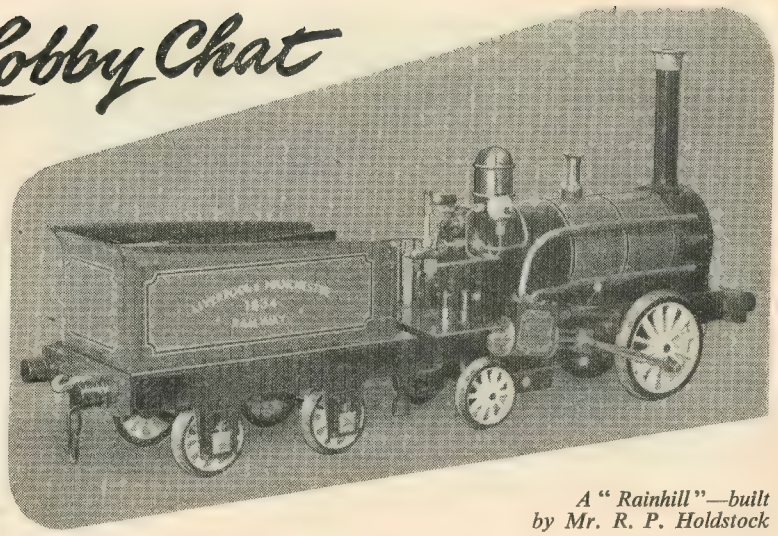
nine modern lathes, one or two milling machines, etc.

Finally I visited a building, where various vehicles—of non-operational, instructional category—were in various stages of assembly. With facilities such as this, M.T. students are able to get practical experience with complete vehicles (including motorcycles, incidentally) as well as with their somewhat less glamorous component parts. Attached to this building is an engine test house, complete with the customary Heenan & Froude dynamometer test bed.

I came away with the feeling that at Arborfield, at any rate, there is no sense of frustration arising from the existence of large, well-equipped armed forces which have no battles to fight, no great expeditionary forces "straining at the leash"; for here, instead, the young soldiers find themselves willingly involved in a great campaign which has as its objective the establishment of many strongholds of craftsmanship throughout the country.

The photographs illustrating this article are by courtesy of the Army Public Relations.

L.B.S.C.'s Lobby Chat



A "Rainhill"—built by Mr. R. P. Holdstock

MY NEW LATHE ON THE JOB

AS promised recently, here goes to record how the new acquisition to the Purley Locomotive Works is behaving itself. It started under a severe handicap, at the outset, being installed in place of a Drummond which had given excellent and trouble-free service; as its immediate shopmates, it has the Milnes type R Lathe which has been in use for 31 years this month, and has done everything required of it, during that time; also the 75 mm. Leinen-Boley precision lathe, which I bought in 1930, to replace the Adams GA type 2½ in. precision lathe which I left over in U.S.A. This machine has also proved itself the cat's whiskers for all jobs within its capacity. Two such formidable neighbours, evidently put the Myford on its metal—sorry, I should have spelt that "mettle"—for up to the present, it is holding its own with ease.

I used to keep the Drummond chucks, and small accessories, on a small nest of stout shelves on the wall alongside the lathe. These now accommodate six chucks and the smaller Myford accessories, but I had to shift them to a higher position, to allow the Myford gear-wheel and belt covers to swing well open. I fixed an extra wooden shelf in the Myford cabinet, to accommodate the two vertical-slides, dividing heads, taper turning attachment, and other items, but I was rather concerned about the "ever-open door" in the cabinet. The Ideal boiler, which heats the house as well as supplying hot water, stands where the fireplace used to be, and I have to clean the fire at least twice a day. You can't clean a boiler fire without raising a certain amount of dust, especially with the fuel dished out in these days of "progress"; coal merchants would not have dared to offer such awful rubbish in the happy days of competition. This dust penetrates to every possible place; I keep the machines clean by frequent dusting (I guess I'd beat any housewife in a dusting contest) but life's too short to do the lot every day. I therefore, made a sort of dust-screen, or door, to cover the opening. It is simply a bit of thin plywood, a little bigger than the opening. On the outside, it has a brass handle, like a cup handle, made from a bit of 16-gauge strip, attached by two 3-B.A. bolts. On the inside, it has two clips, made from the same kind of strip, and fixed the same way. These hook over the upturned edge of the steel shelf already fitted to the centre of the Myford cabinet stand; and the door fits closely against the front of the cabinet, below the switch handle and the brass plate carrying the screw-cutting tables. A slight lift, instantly detaches it, and it is replaced in a second. It is painted the Myford grey; Bro. Myford sent me a small can of cellulose paint which exactly matches the stove-enamelling on the machine. My few personal friends know how I love matching colours!

A "Cast-iron Job"

About ten years ago, I acquired one of those chucks that are seldom found in home workshops, viz., a self-centring chuck with four jaws. I found it very handy for quick chucking of square rod when making injector bodies, and other fittings made from square stock, and made backplates so that I could use it on either the Milnes or the Drummond. I decided to fit this permanently to the Myford, and was just about to alter the existing backplate to fit the new lathe, when Bro. Myford suggested that it would be a saving of time if I fitted the chuck to one of their standard backplates. You can bet your sweet life that I fell in with that suggestion hasta pronto; our friend sent along one of the backplates as supplied for the 4⅜-in. Pratt chucks, and this suited the four-jaw self-centring gadget exactly. All I had to do, was to take a skim off the face, turn the register, and drill the holes for the screws.

To turn the register, I put the belt from motor to countershaft, on the lower of the two speeds, the belt from countershaft to mandrel on the highest speed, and put the back-gear in. This gave a mandrel speed of 80 r.p.m. One of the Myford tipped tools did the needful, and went through the cast-iron like a knife through cheese, without the ghost of a chatter. The machine being new, it is hardly necessary to add that I didn't stint the oil feed; trust an old footplate merchant for *that*! The whole job was done in about 40 min. and I was very pleased with the result. I don't think that the Milnes would have done it any better, though it might have done it a little quicker, using the lowest direct speed, and a carbide-tungsten tool. But I wouldn't force the new machine, naturally.

It Can Make Injectors!

The "supersonic" being now all set for locomotive work, I thought I'd give it a light job by making a few injectors, as I didn't make any for Christmas presents. The four-jaw self-centring chuck mentioned above was put on, and a bit of $\frac{5}{16}$ in. square brass rod put in it. A

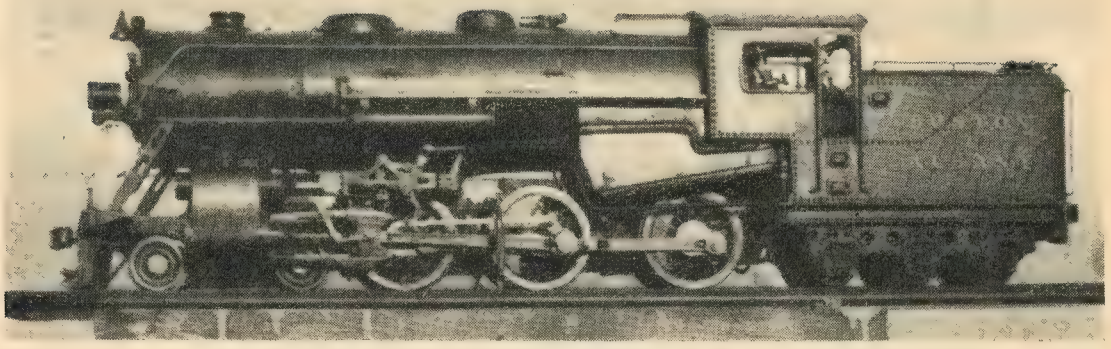
piece of round rod, to act as a parting-off stop, was put in the tailstock chuck, and brought up to touch the projecting square rod. The parting-tool in the turret (I had already ground up and set the four tools in the turret) was then adjusted to cut off a $\frac{3}{8}$ in. length; the rod was pulled out of the chuck until it touched the stop, another bit parted off, and ditto repeato until all the rod was used up. This gave me eight lengths. Each of these was rechucked in the self-centring four-jaw, and centred, drilled and reamed to 5/32 in. in the usual way I have described before; I found that the quick screw feed of the Myford tailstock, which advances 3/10 in. per turn—it has a three-start 10-pitch screw—could be operated as quickly as the lever tailstock on the Boley. One thing I noticed at once was that the bigger machine made remarkably easy work of the drilling. Both ends of each piece of brass rod were then turned to $\frac{1}{4}$ in. diameter for 5/32 in. length, and screwed $\frac{1}{4}$ in. × 40. The four-jaw being self-centring, I simply reversed the bits of rod for machining the second end, which was quick. The speed used for the drilling and reaming, was 1,020 r.p.m. with the motor belt on the highest speed, and the lathe belt on the second largest mandrel pulley. For the same job on the Boley, I use top speed, 1,250 r.p.m. The top speed of a Myford ML7, which is 640 with a 2-in. motor pulley, or 870 with a $2\frac{1}{2}$-in. pulley, is quite O.K. for similar work, provided that the drill is not forced. The secret of correct drilling is to regulate the feed to the speed. For the screwing job, the die was held in the standard Myford tailstock die-holder; and I tried both pulling the belt by hand, lifting the belt guard for the purpose, and slipping the clutch. I found the latter most convenient, once I had got used to it. The old—ahem ! dog soon learned *that* new trick; and I found it a convenience to reverse the motor to run the die off the thread, instead of having to pull the belt backwards.

For drilling the cross holes in the embryo bodies, and counter-boring for the airball chambers, I used the drilling machine as usual, although these jobs *could* be done in the lathe, if necessary, with a drill in the three-jaw, and the body held against the flat tailstock drilling-pad. The Myford drilling-pads fit over the female centre.

The airball chambers were made from $\frac{1}{2}$-in. round brass rod. To chuck this, I used the Burnerd 4-in. three-jaw supplied with the machine (" L.B.S.C. uses these and likes them," says the advertisement—and it is correct !) plus the improvised stop in the tailstock chuck, as used for the bodies. Eight $\frac{3}{8}$ in. lengths were whipped off in two wags of a dog's tail. One of them was centre-popped $\frac{1}{16}$ in. off centre, to locate the centre of the ball seating, and this was chucked in the Burnerd 4 in. independent four-jaw, with the pop-mark running truly. It was then centred, drilled right through with No. 34 drill, opened out and bottomed with 7/32-in. drill and D-bit, and the remains of the No. 34 hole reamed $\frac{1}{4}$ in. All the above jobs were done at the same speed mentioned above; and the quick-acting screw in the tailstock barrel was as easy to manipulate as the Boley lever tailstock. To gauge drilling depths on the latter, I fitted a Starrett rule, on top of the tailstock casting, working in a slide; this indicated depth of drill-hole at a glance. On the Myford, the tailstock barrel itself has graduations marked on it, and these serve the same purpose.

The next job was to tap the hole $\frac{1}{4}$ in. × 40, and here, the old—er, um ! dog had to perform two new tricks at once. I got the tapping speed by slipping the clutch, same

Mr. J. Brock's home-made cabinet stand for his lathe



A fine 3½ in. gauge American tank engine built by Harry Allin

as when screwing, as mentioned above; but the tap was held in the tailstock chuck, and the tailstock itself was too heavy to be pulled bodily along the bed by such a small tap as it entered the hole.

The answer to that one was dead easy. When the tailstock barrel is run clean off the threads of the three-start screw, there is still plenty of barrel length left in the bored hole in the tailstock casting; so I just ran it off, and the barrel, sliding freely "without let or hindrance," guided the tap whilst it cut the threads. The tap was run out of the hole by reversing the motor; so all of that operation was done by a method entirely new to the Purley Locomotive Works. To finish the batch, I simply slacked jaws No. 1 and 2, removed the machined piece, put in an unmarked blank, closed the two same jaws on it, and ditto-repeatoed operations, no further marking-out being required. The lathe speed remained the same.

A bit of ⅜-in. brass rod was next chucked in the three-jaw, $\frac{3}{16}$ in. of it turned to ¼ in. diameter, and screwed ¼ in. × 40. Each ball-chamber was screwed on to this, and the end turned down for about 1/32 in. length, to a tight fit in the counterbore in the injector body. I noted the setting of the cross-slide when finishing the first one, and turned the rest to the same setting. They all fitted exactly, which was a good test for the accuracy of the slide-rest. The same precision was evident when I turned the spigots of the union nipples for the water connections under the injector bodies. To make these, I put on the 3-in. lever scroll chuck, and held the ¼-in. rod in that, for centring, drilling and screwing. It held the rod quite truly, tight enough without undue pressure on the lever, and was quicker in action than the geared scroll chuck. To turn the spigots, I just reversed the nipples in the chuck, and it held them truly without marking the threads. As the lathe bearings were still cool when I started the nipple job, I put the belt on the next higher speed: viz., 1,480, but took care to avoid slamming the clutch in too quickly; this speed was used to turn the spigots.

The bodies were then assembled, and silver-soldered up, in the way I have already fully detailed out in previous notes; the air-balls fitted to the seatings, and the screwed caps made. These were turned from $\frac{5}{16}$-in. hexagon rod held in the 3-in. lever scroll chuck, the screwing being done in the same way as the ends of the injector bodies. I used the lower lathe speed for the turning and screwing.

Supersonic!

The cones were the next job; and here, I thought, we shall see what's what. I shifted the belt to the 1,480 speed again, and turned down a piece of $\frac{3}{16}$-in. brass rod to a drive fit in the bore of the injector bodies. The end of this was centred, and drilled with a No. 72 drill for about $\frac{5}{16}$ in. depth, holding the drill in a pin chuck, which was in turn held in the ½-in. Jacobs tailstock chuck supplied with the Myford. Beginners note: When using these weeny-weeny drills, have only enough projecting from the pin chuck to drill the required depth of hole. The point of the drill went plumb into the centre-hole, so there was no doubt about the truth of the tail-stock and the two chucks. As the Myford was already running faster than the Boley, I tried feeding the drill in with the screw-feed of the tailstock, and found it just as sensitive as the Boley lever; the higher speed was partly responsible for that, naturally. The cone blank was then parted off, reversed, and reamed taper; cut across, and the cut ends trimmed back, as I have described in injector-making instructions.

Then came *the* test. The combining cone was pressed in, and then a piece of 7/32-in. brass rod was chucked, and turned down to a tight push fit in the delivery end of the injector body, to within 1/64 in. of the combining cone. The end of this was centred, and a No. 77 drill put in the pin chuck, held in the Jacobs chuck in the tailstock. The belt was shifted on to the top speed, 2,150 r.p.m. and the clutch let in very steadily. Boy-oh-boy—*did* she whizz! I wouldn't chance feeding with the screw, for the kick-off; 77 drills cost muckle siller the noo, ye ken, an' ye dinna hae tae break mony, tae break the bank as weel! Therefore, I ran the barrel off the screw, carefully gripped the Jacobs chuck, and gingerly slid the needle up to the whizzing cone. I need have had no qualms! It went in like poking a pin through a piece of paper. I let it go in for about $\frac{1}{16}$ in. and then withdrew it to clear the chips off; after that, I carefully worked the drill back and forth, same as I do on the Boley, until the drill had penetrated full depth.

The rest of the job was plain sailing. The outside of the cone was finished to correct shape, parted off to leave the flange, reversed in the chuck, and taper-reamed; the 1,480 speed was used for these jobs, as the bearing had warmed up a little, and there is no need for the full speed for turning the outsides of the cones. The steam cone was made in similar manner to the delivery cone, the 67 drill being put

through easily, with the 1,480 speed, fed in with the screw feed. The rest of the cones for the eight injectors were made as described above; and just for the sake of curiosity, I tried feeding in the No. 77 drill with the screw feed. I couldn't feel any resistance at all on the handwheel, so carefully gauged the drilling depth by quarter-turn stages; but I wouldn't recommend using the handwheel for so small a drill. It is far safer to run the tailstock barrel right off the screw, as I did at first, and feed in by sliding the barrel by hand, using the Jacob's chuck as a grip.

After getting through the above jobs, the check-valves, or clacks were just a piece of cake. The bodies were made from $\frac{5}{16}$ in. round rod, the recesses for the balls and the seatings being machined up exactly as described above for the airball chambers; the rod was held in the 3-in. geared scroll three-jaw. Incidentally, I found the key of this too short; kept on knocking my fingers against the oil reservoir when using it, but as the long key belonging to the big four-jaw fitted the holes in the chuck pinions, I used that—exchange is no robbery ! I often wonder why the spindles of chuck keys are made so short; the original key of the 3-in. Harles chuck on my Boley lathe, wouldn't clear the brass lubricator on the mandrel bearing, so I had to make a longer one. The key of the 3-in. Whiton only just misses. It was the same when I was on the munition job in the latter part of the Kaiser's war; I had to get the toolmaker to make longer chuck keys for several of the lathes, so that the girls wouldn't risk hurting their fingers.

The sockets for screwing the check-valves on to the injectors were made from $\frac{5}{16}$-in. rod held in the same chuck as above; and the combined cap and union screw for each, from $\frac{5}{16}$-in. hexagon rod. Both lots were done, using the 1,020 speed, on account of the screwing. All the injectors passed the service test, feeding perfectly, running or standing; so I awarded the Myford lathe full marks, and bracketed it with the Boley for accuracy. However, I shouldn't use it regularly for such small jobs as making injectors, whilst I have the Boley; the reason being, that the hefty half-horse-power motor on the Myford uses about twice as much juice as the little quarter-horse (or should I say pony ?) which drives the Boley. But I can tell you this: the Myford is booked up for many jobs which I have hitherto done on the Milnes; the greater speed range, the clutch, and the reversing motor, are very great conveniences.

The slower speed of a Myford ML7 is no drawback to injector making, if the drill feed is adjusted to the mandrel speed; but a sliding barrel to the tailstock, or an equivalent, is needed for cone drilling.

For the BOOKSHELF

Master in Sail by Captain James S. Learmont, published by Percival Marshall & Co. Ltd., London. 2nd edition. Illustrated 12s. 6d.

Anyone who builds a model of a square-rigged ship would gain greater pleasure from the work by knowing as much as possible of the history and adventures of the original. He can then follow her in imagination through the grey reaches of the Channel, across the Bay, running before the wind down the Spanish and N. African coasts into the North East Trades, through the Doldrums and the long reach across the easterlies of the South Atlantic to the coast winds of the South American seaboard, and down to the cold seas and everlasting headwinds of Cape Horn. Following a long voyage, if only in a book, one thinks of the huge stresses to which the fabric of a ship is subject, not once or twice in a day, but incessantly, often for weeks on end, and one wonders how any man-made thing can be built to endure them. Having read Captain Learmont's book one still wonders. There must be some magical skill with which the great hull is " threddled among the seas," like playing judo with the powers of nature. In this book the master unveils some of the secrets of his art, and they have a familiar look. It is just sheer competence and knowing all the relevant facts. The winds and the tides obey regular laws; given enough knowledge, they may be used to lever the ship round the world with almost the certainty of a ferry service. An example of this combination of knowledge and nerve is the author's account of rounding Cape Horn from Staten Island and into the Pacific in a single rush of 275 miles in 24 hours. As master of the full-rigged ship *Brenda* he was becalmed off the island, but a light easterly breeze sprang up which gradually freshened to a moderate gale. Knowing the behaviour of this type of winds thereabouts, and knowing that they do not shift, but die away to a calm as they begin, he let the ship drive before it all night and next day, under all sail including royals. To prevent the royal sheets carrying away an extra rope is added to the falls. Only the most exact knowledge of the capacity of the royal yards and rigging to accept the strain enabled the chance to be taken. Many such examples could be quoted from the book, resulting in record passages made in ships not considered by other masters to be weatherly. Her previous Captain said that the *Brenda* could not sail !

Part of the secret of the efficiency of the ship and her gear lay in the master's treatment of the apprentices. Instead of regarding them as cheap labour, he took pains to educate them in all branches of their profession. The result of this was a versatile crew which could, and often did, make itself independent of shore labour even for major repairs. His whole attitude to the ship and her company is in striking contrast to the dreary egotism of many contemporary masters in sail.

The illustrations to the book are important, as six of them were painted by John Grier an apprentice in the *Bengairn*, so they can be relied upon to give the authentic information, especially the one of the *Bengairn* with her cargo shifted lying on her beam ends in a strong gale in the Tasman sea. The ship was saved from this peril by cutting away about 80 tons of gear above the main and mizzen lower masts, and the accounts of her return to port and subsequent re-rigging, mainly by her own ship's company, are among the best things in the book, and are of fascinating interest to model makers.

What makes the book impressive is that the Captain's style is plain and simple. There are no " frills, no fal-lals," and one's imagination is left free to fill in the details of the more scarifying incidents. Being the master of a sailing ship is not a vocation to leave much time for musing.—N.A.O.

Marine Models at the Norther

Reported by "N

AMONG the large number of marine models at Manchester were quite a few based on unusual prototypes. One of these was the free-lance fire-fighting boat built by Mr. W. Ogden of Oldham, whose effort won First Prize in its class. The model is fitted with the fine opposed-twin-cylinder petrol engine which Mr. Ogden exhibited last year. Readers may remember that it is fan-cooled and of 13 c.c. capacity, with side-valves.

The hull of the boat is unusual in being built in two halves, which are fastened together by two bolts only. This, of course, is for ease of transport; the halves are carried in two small cases which are much easier to take about on public service vehicles than would be one case nearly five feet long. Even with a private car, a biggish boat is not too easy to transport, and I commend Mr. Ogden's idea to others. The joint is unnoticeable, with care. The hull is of dural, with angles (formed from sheet) at chine and gunwale. To these and to the frames the side and bottom sheets are close-riveted, making a very strong, but light, hull. The superstructure is built in the same way.

Variable Pitch Propeller

Another feature of this boat is the reversible-pitch propeller, giving any speed from zero to full ahead or full astern. Control is by a lever and as the boat comes in to the bank the propeller can be switched to neutral, the boat swung on its axis without having to fight prop.-thrust, and then, the propeller being put ahead again, the model moves away without trouble. Again, I commend the idea to others; it seems to me that a reversible pitch propeller would be particularly useful in radio-controlled boats with i.c. engines.

Mr. Ogden had another brain-wave, regarding his petrol-tank. The carburettor is fed from a tank which has an open top, into which a separate perspex tank fits closely. The latter feeds the former on the well-known chicken-feed principle, and contains enough fuel to run the boat for half-an-hour at a speed of 6 to 7 m.p.h.

Now when it is seen that the perspex tank needs refilling, it can be lifted out of the boat to do so (which is a distinct advantage, of course), leaving the engine running on the supply left in the lower tank, with the propeller in neutral.

Returning to the engine, ignition is by magneto converted from a full-sized one, though Mr. Ogden is now making his own. Ten different designs of carburettors have been made and fitted, but the builder finds that the one which gives the best results is the simplest one. Incidentally, in consideration of the neighbours' TV sets, the plugs are fitted with suppressors.

The fittings include a swivelling towing-hook, which actually controls the twin rudders, and of course the monitors for fire-fighting. An engine driven pump is to be fitted to supply these with water under pressure, and here the v.p. propeller will be useful again, for it will be possible to run the pump whilst keeping the boat stationary.

One more feature is that in order to protect the propeller blades and/or crankshaft, a special clutch is fitted to the drive; if the propeller hits an obstacle and is stopped suddenly, the clutch slips.

The boat was built in a workshop simply equipped, with a home-built 5-in. lathe and home-built drilling-machine. The only parts purchased were the spark-plugs and light bulbs; all the rest was scrap material from various sources.

A Motor Salvage Tug

Second Prize winner in this class was J. Bowness of Stockport, with his motor salvage tug *Dolphin*. This was built from A. D. Trollope's drawing of *Titan* in THE MODEL ENGINEER series, and a very impressive model is the result. At the same time, Mr. Bowness told me, he had studied a model of the prototype in the Imperial War Museum, and as a result had altered one or two of the external details.

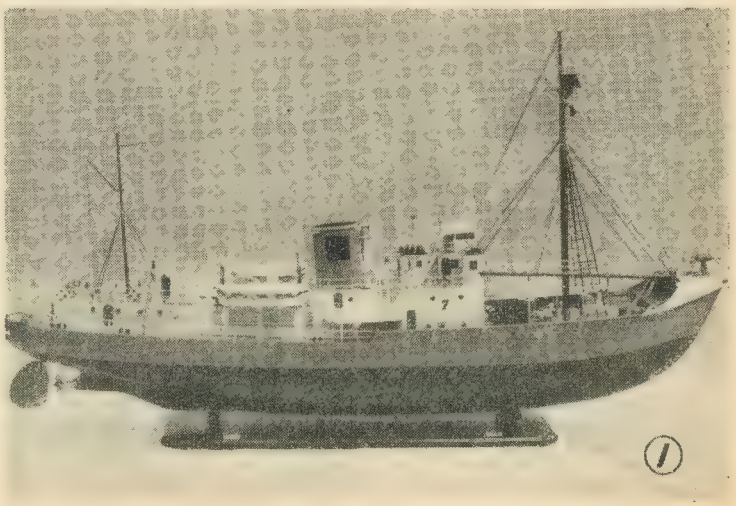
The hull is made from copper plates soldered on ribs made from brass curtain-rail; it is somewhat "wavy" in its lines, which is probably due to the difficulty of the plates warping under the heat of the soldering bit. Propulsion is by an electric motor from the "surplus" market, rewound to suit 10 volts supplied by accumulator. The boat will achieve 7 knots, and is powerful

(1) *Mr W. E. Barnes of Wilmslow chose an uncommon prototype for his latest model—a whale catcher*

(2) *This inch-scale fire-boat, built by Mr. W. Ogden, is made in two halves for ease of transport*

(3) *Another out-of-the-run model was the radio-controlled submarine by Mr. R. H. W. Beebee*

(4) *Based on "M.E." drawings, this fine model of a salvage tug was built by Mr. J. Bowness of Stockport*



·n Models Exhibition

NORTHERNER"

enough to pull a rowing boat with two passengers.

It was the original intention to fit an i.c. engine, and to this end a bilge pump and circulation pump were fitted; these may be used later if an i.c. engine is built.

Deck fittings are very numerous, and well carried out; incidentally the deck is laid with well-fitted separate planks. The stanchions are cast in white-metal, a feature for which friends forecast disaster, but so far they have stood up to requirements.

2

3

4

Probably the fact that the rails are of silver-steel wire makes a considerable difference to their strength.

The method of making the stanchions may be of interest to others. First a pattern was turned, and drilled through the balls. Pins were put through these holes, and a plaster of paris mould was made from the pattern and pins.

Now the pattern was removed from the mould, and the pins replaced in their prints. When the white metal was poured and set in the mould, the casting on removal only needed the pins pulling out to be ready for fettling and fitting, with the holes for the rails already cast in.

The mast ladders were pressed out from strip with a square punch and die, but that on the funnel was made in the conventional way from drilled strips with pins soldered in the holes. By the way, all turning was done in an electric drill, with files.

This boat is to be radio-controlled; the equipment has already been made and will be installed shortly.

A Model Whale Catcher

Another impressive model was that of a modern whale catcher, built to ¼-in. scale by W. E. Barnes of Wilmslow. This too was very detailed, but unfortunately the detail was incorrect in some respects.

For example, the falls on the davits were of copper chain, with links much too large for scale, and the steering-wheels, binnacles, and engine-room telegraphs were left as naked brass. The treads of the ladders were 3/64 in. thick, which

works out in the scale at 2¼ in., and the metal of which the firebuckets were made was (to scale) ¾ in. thick !

Further, the paintwork could have been better; for example, the grain of the wood showed through in places, denoting insufficient rubbing down and filling, while there were blobs round some of the junctions of hand-rails and stanchions.

I recall making similar remarks last year about Mr. Barnes' free-lance model of a luxury liner, which then won First Prize in this section. This year, however, with much tougher opposition, he has to be content with an H.C. certificate. A pity, because this builder makes good models, which with just that little extra attention to detail and finish could be so very much better. No offence meant, Mr. Barnes, but I *do* know what influences judges !

Radio-Controlled Submarine

A very unusual model was a radio-controlled submarine built by Mr. R. H. W. Beebee of Worsley. The hull is of wooden construction, about 4 ft. 9 in. long, built-up and carved to shape.

Control is by the resonant reed system, using six reeds, and governing the steering, stop, reverse, and diving control. The latter is automatic, once started, and the boat dives, travels underwater, and then surfaces after a given period of time.

This vessel was awarded First Prize in the radio-controlled models, and by the way, the latter in general were appreciably better than last year.

It will be recalled that in my report on the 1953 Southport Exhibition, published in November, I described and illustrated a magnificent model lifeboat, with its carriage, built by Mr. G. W. Hinchliffe of Preston. This won the Championship Trophy at Southport, and has now won added laurels at Manchester, being adjudged the best marine model in the Northern Exhibition and receiving, therefore, the N.A.M.E. Marine Trophy.

It is not here proposed to add further to my previous description, but I would like to congratulate Mr. Hinchliffe on this latest achievement. In passing, two more prizes came his way at Manchester.

Other marine models were there in plenty at the Northern show, but we can't mention them all. Among the uncompleted boats was Mr. F. W. Waterton's high-speed ship's tender; a lovely piece of work, with the six-cylinder engine which the builder recently described in these pages. Perhaps we shall see it finished at the next N.A.M.E. show, it was a " First " winner this time.

In the non-working ships, First Prize was awarded to the Rev. A. Everall of Sheffield for his tubular lifeboat, which has been illustrated and described in previous issues. Then there were two of those lovely bone models made by French prisoners of war, exhibited by Mr. S. W. Catchpole of Timperley; these were well worthy of examination.

Taking it all round, I think it can be said fairly that the marine models of this year were generally improved on those of 1953, but there are still too many exhibitors who skimp the time spent in finishing. This appears to hold good at all shows, however; what a pity it is that excellent models should lose an award for the sake of a few hours extra work !

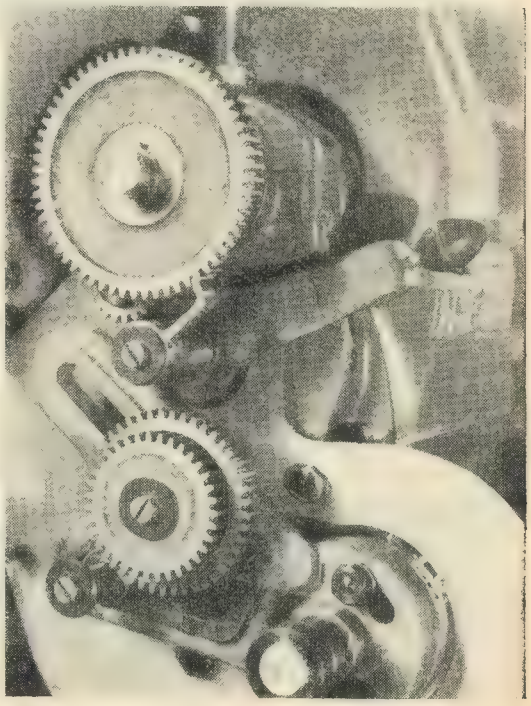
INDEXING DEVICE ON MANDREL

By J. Trethewey

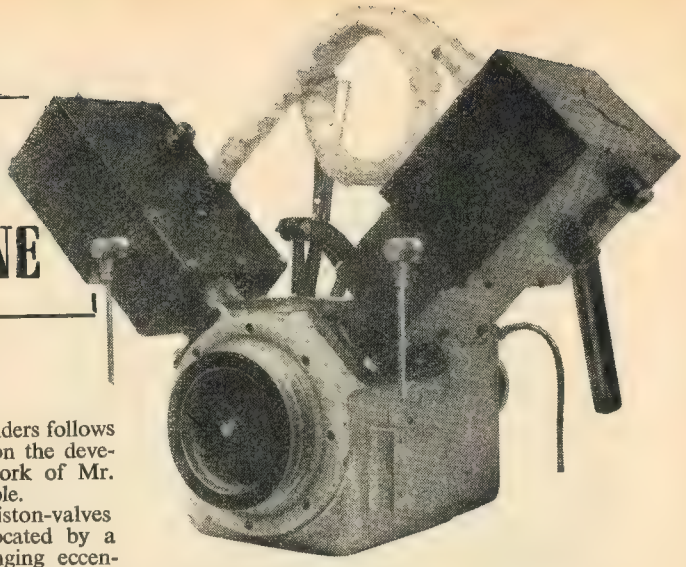
FINDING the need for some means of indexing the mandrel on my M.L.7 lathe, I made up an expanding shaft similar to that described by Mr. L. H. Sparey in his book, *A Man and His Lathe*. to fit in the hollow mandrel and carry a 60-tooth change wheel at the outside end. In view of the lack of suitable fixing points for a plunger device which could be used with the belt guard in position, I hit on the following method of locking the change wheel.

A piece of mild-steel bar was chucked in the lathe and turned down to ⅞ in. diameter, bored and reamed ⅜ in., and parted off 1⅛ in. long. A groove ⅛ in. wide and about ⅜ in. long was milled to a depth of ⅛ in. along this, into which a piece of mild-steel ⅜ in. wide and 1⅛ in. long, was brazed with " Sifbronze." Before brazing, a " toe " 5/16 in. long was turned to make the actual pawl, and left to be filed to shape later. The tumbler-gear was then removed and a 5/32 in. clearance hole drilled in the thickest part of the casting beside the pivot hole in the arm. The arm and the sleeve were then assembled on the lathe, the pawl filed to fit between the teeth of the change wheel, and the arm and sleeve marked with pop-marks, whilst the pawl is engaged and the arm located in the top hole. The arm and sleeve are again removed, and a 5/32-in. hole drilled in the sleeve through the hole in the arm. In order to ensure that this is located correctly, it is advisable to turn up a stepped spindle to the same dimensions as the spindle on the lathe, and assemble the arm and sleeve on this before drilling, using the pop-marks to determine the correct position. A piece of 5/32-in. silver-steel is then knurled at one end and pressed into the sleeve to form a pin. Case-hardening the pawl completes the job.

In use, the pawl is moved in and out of mesh by moving the tumbler arm between the top and centre holes. It is kept in position by the screw and washer provided for retaining the gear.



A VEE COMPOUND STEAM-CAR ENGINE



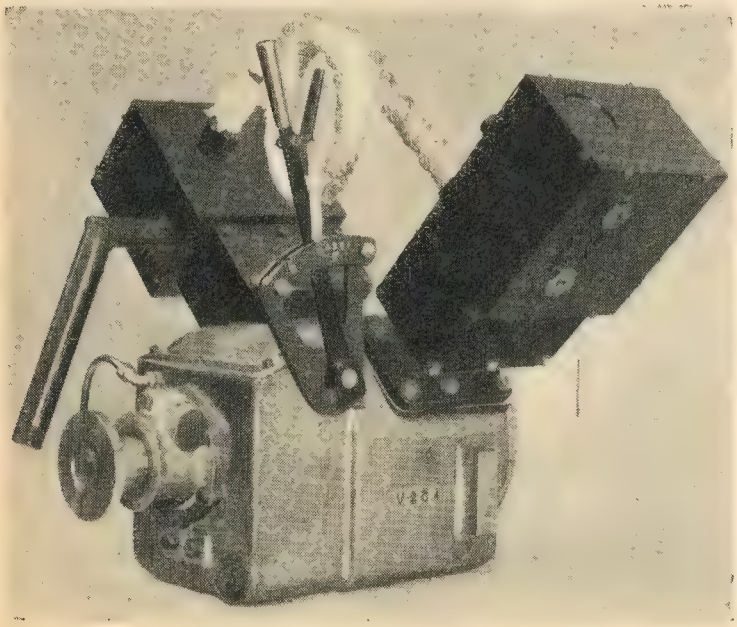
By Thos. Hindle

THE photographs reproduced herewith convey a good impression of one of the prototype steam-car engines which I am developing.

This particular engine has two double-acting cylinders disposed at 90-deg., and both piston cross-heads are connected to the single overhung crank. The engine is of the receiver or cross-compound type, the high pressure and low pressure cylinder bores being respectively 1¾ in. and 3 in. diameter, with a common stroke of 2 in. The cylinder volume ratio, therefore, is 2.94.

Steam distribution is effected by hollow piston-valves, fitted with narrow rings. The valve-ports, complete with bridge-bars, and the passages to the cylinder bore, are cast-in, so avoiding the use of separate valve-liners. The valves are balanced to steam pressure due to the complete circumferential spread of the ports, which together with the passages, are of generous area. Obviously, the general design of the cylinders follows closely upon the development work of Mr. Abner Doble.

Both piston-valves are reciprocated by a single swinging eccentric, which is mounted on the crankshaft (with which, of course, it revolves) in a manner which allows its effective throw, and also its angular position relative to that of the crankpin. to be varied by the hand control shown in the photographs. This arrangement provides for full-gear forward and reverse, and any desired number of intermediate notches between mid-gear and full-gear forward. To ensure good starting under load, full-gear valve travel in either direction provides for admission over 75 per cent. of stroke, and in the forward direction, the selected steps enable the steam cut-off to be "notched-up" to 55 per cent., 34 per cent. and 21 per cent of the stroke.



The cylinders are equipped with built-in automatic water-release valves, which rapidly clear the condensate when starting-up the cold engine. The piston- and valve-rod glands are extra long, and are fitted with lantern-rings and leak-off drains to dispose of condensate leakage when starting up from cold.

All bearings are of the roller or ball type. The pistons are solid with the piston-rods. The connecting rods and crankshaft are machined from high-tensile steel forgings, and the crankshaft is splined to receive the half-coupling. The twin-groove pulley at the front end is driven by a lazy crank, the shaft of which also runs in ball-bearings. This pulley is intended for driving the car dynamo and other auxiliaries.

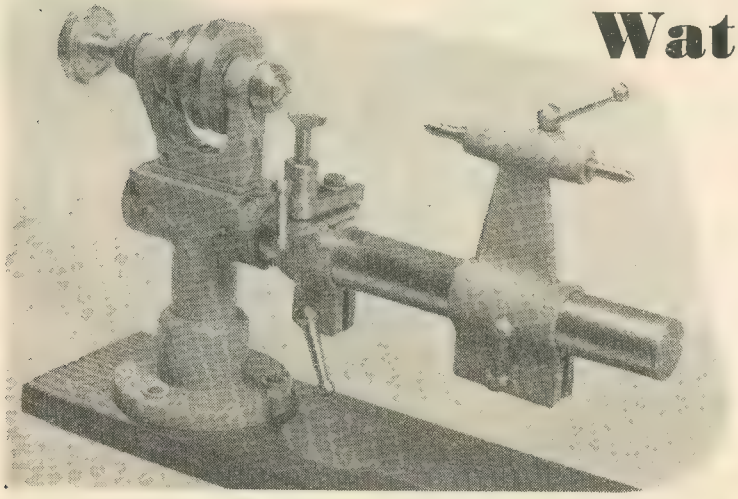
The engine is now under brake and steam consumption tests on high pressure, superheated steam being supplied by a monotube generator of 40 sq. ft. heating surface, equipped with an atomising burner capable of consuming five to six gallons of kerosene per hour.

I have made no secret that my personal preference is for poppet-valves, which in my opinion offer important advantages for use with *highly* superheated steam. Nevertheless, piston-valves deserve equal consideration, as they have proved most reliable when used with superheated steam not exceeding a maximum total temperature of 800 deg. F.

Under any such conditions, of course, the valves and pistons must be effectively and continuously lubricated by specially selected oil, fed under pump pressure directly into the steam pipe at a point near the engine steam-chest.

Building a small Watchmaker's Lathe

By "Midlander"



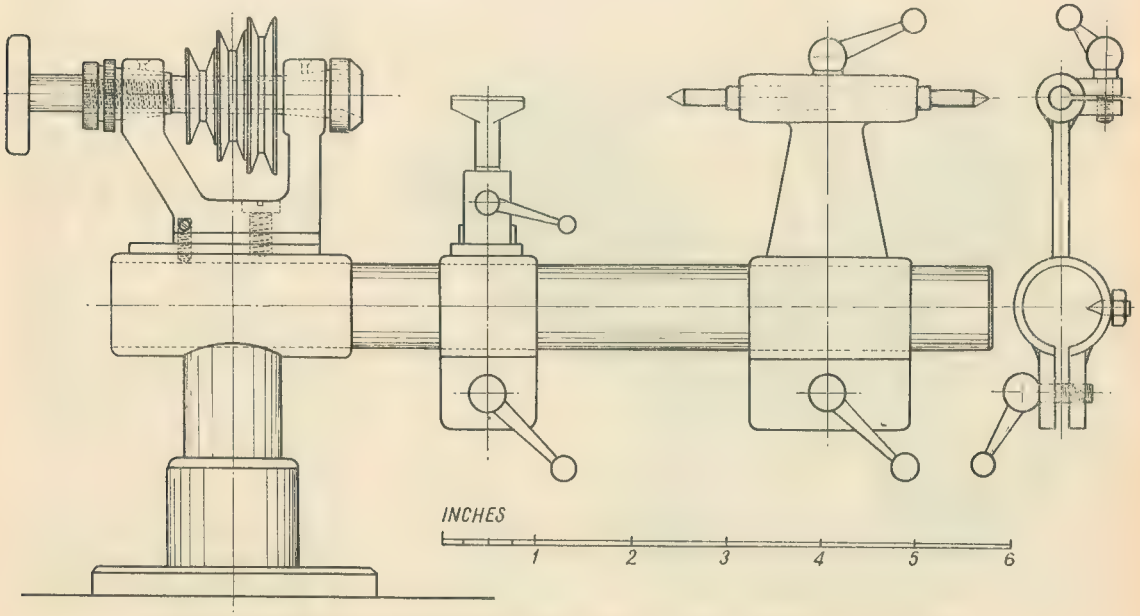
The finished small watchmaker's lathe

DURING the intervening periods between building models, I have often indulged in another favourite hobby of mine, namely that of designing and building small machine tools.

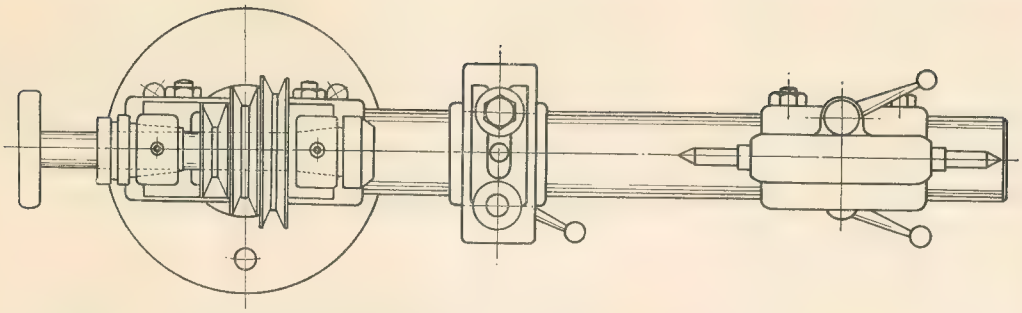
Some of my efforts have been recorded, and I hope have interested many readers of THE MODEL ENGINEER; at the same time I would point out that my main reason for writing these articles is mainly to assist the amateur, who cannot afford the present-day prices of machines, and who would like to have a try at building them himself. In this way, not only does one have the satisfaction of constructing such a machine, but will undoubtedly find the completed machine a useful asset to the workshop. Furthermore, these articles are only recordings of my own particular work in this direction, and no doubt the reader will use his own initiative when constructing a machine for his own particular requirements, using the general design and incorporating his own ideas.

Toward the latter end of the war I began to construct a series of small machines, some from scrap, others from castings. Some I have still at work in my own workshop, others are in the hands of my model engineer friends, and are giving good service. From their construction and constant use I have gained considerable experience in this field.

The early lathes I built then were mainly wood lathes, though I did rebuild an interesting 4-in. b.g., s.c. lathe which was of all welded construction. The wood lathes were very simply constructed, the headstock, tailstock and the rest were made from castings while the bed was of angle-iron. They were not elaborately constructed, but were



Side elevation of the watchmaker's lathe, round bed type, reproduced to half scale



Plan of the small lathe

sturdy and worked very well, and are still going strong now. The early type headstock bearings were plain cast-iron, split in the usual manner, and though I do not recommend this method, this type headstock has given good service. I very soon, however, turned to ball-bearings, and this method of construction for the headstock of such a lathe is the better one in my opinion. I later built a number of combined grinders and saw-benches to take a 4-in. grinding wheel and saw, using first, welded sections and then castings, which of course is the neatest method. If readers are interested in any of these designs I can describe them in some other article in the future with the editor's permission.

From these simple machines, I then turned my attention to small lathes, and I decided to make a small lathe of the watchmaker's type which had in this instance a tee-rest once again such as is used in this work.

Ball-bearings

The bed consisted of two lengths of bright mild-steel bar, bolted to legs which were castings. The headstock and tailstock were castings of bronze, though why bronze, I am not quite sure now, for cast-iron would have done just as well. The headstock was fitted with ball-bearings, that is, a standard ½-bore ball-race at each end.

Was this wise ? I hear the experts say, for they all seem to fight shy of the ball race for this type of work. The answer is that when the machine was completed and tested by a watchmaker, he was very satisfied with its performance, and as I have not heard anything to the contrary I am presuming it is still in use. I have since built another headstock for a friend of the original purchaser of the first lathe and he too, was very satisfied with the design.

The idea of building the lathe illustrated here was evolved when I was presented with the headstock and spindle, it being at the time described as " a bit of junk." From its design, I gathered it had come from a small watchmaker's lathe of pre-war vintage, so I produced drawings for a conventional type of lathe, the result of which you see reproduced herewith.

This headstock is made from bronze or similar material and the spindle is of the coned type running in the taper bores of the headstock. The design is rather simple and efficient, for any endplay which may develop can be taken up by screwing the tail end taper sleeve further along the spindle locking same with the knurled locking-ring at the end.

The Leg and Base

The first step in the construction was the main leg by which the machine is clamped to the bench. The base itself was turned from a piece of 3-in. diameter mild-steel and a piece of $\frac{13}{16}$-in. bore-pipe was welded horizontaly across the top of this. A piece of plate was welded to the top of this, to which in due course is bolted the headstock. This whole unit was chucked in the lathe and skimmed up on all important surfaces, that is, the top of the flat plate and bore of the tube which is to take the round bed of the lathe.

The tailstock was built up next from tube, pieces of plate, and a length of ½ in. diameter mild-steel. These were clamped in a simple jig and welded together to form the body of the tailstock. It was then checked and bored to take the bed, the diameter of which was mainly determined by the bore of the tube of the head unit. The tube was then split with a hacksaw, the two pieces of plate welded to the underside of tube being drilled to take the clamp-screw, which was fitted later. The hole for the tailstock spindle was then drilled and reamed ¼ in. diameter. This section was then split through with a hacksaw and also drilled for a clamp-screw to lock the tailstock spindle in any desired position.

The tee-rest bracket was made up and welded in the same manner as before, the clamp which holds the tee-rest itself being cut from a length of ⅜ in. × ⅝ in. steel. The tee-rest was turned down from round mild-steel, the top section being cut and filed from solid, which makes a neat job. The tee-rest clamp is bolted to the bracket by means of a single $\frac{3}{16}$ in. B.S.F. bolt which is a simple arrangement but quite effective.

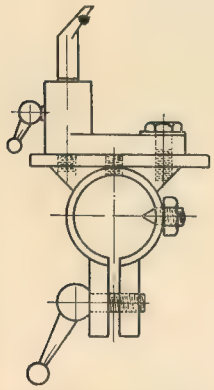
Bed Construction

The bed was turned from a piece of 1 in. diameter mild-steel and was made in accordance with the bore of the tube of the head unit, the tee-rest bracket and tailstock. A vee was planed in this, which forms a guide for the tee-rest bracket and tailstock when sliding along the bed; $\frac{3}{16}$-in. B.S.F. studs, filed to the angle of the vee in the bed, are fitted through the tubes in the components to engage in the groove. They are easily adjustable and are fixed in position by means of locknuts.

The lathe was by now fast taking shape so the next stage was to fit the headstock to the head unit. It was necessary to fix a second piece of plate on to the top of the head unit to obtain the desired centre height. The headstock is secured by a ¼-in. B.S.F. stud through a hole which was already there. At the left-hand end of the headstock base is a slot, on either side of which small adjusting screws are fitted. Another stud, projecting vertically above the head unit plate, goes up into this slot, the two small adjusting

screws being tightened on to it to give correct headstock alignment, which is very useful should adjustment be necessary.

When I received the headstock, the spindle was already in it so I next decided to add the pulley which was turned from mild-steel. The collet drawbar was next turned from mild steel and fitted with a brass handwheel. Difficulty was experienced in tapping this drawbar to take the collets, which were of the standard commercial 8 mm. type. The threads are 40 t.p.i. and slightly over ¼ in. outside diameter and so I had to overcome this by working the ¼ in. diameter tap, which I had in the hole and so opening the thread slightly till the collet fitted.



Detail of the tee tool rest

The remaining parts, such as tailstock spindle, which was turned from silver-steel and the various small clamp screw handles, from mild steel, were then fitted, and the machine was ready for a trial. A small motor was procured, fitted with pulley, and coupled up to drive the lathe with an odd length of small round belt. When the machine collet was fitted with a length of steel and revolved, it soon became apparent that it was not true. That meant that the locating taper of the headstock spindle was out, and I found out in due course that the taper angle was slightly out, too.

I was not to be beaten at this stage, however, and so after several attempts at truing same and being unsuccessful, I came to the conclusion that the whole bore of the spindle was out too.

I then turned a complete new spindle, retaining only the taper sleeve and the locknut of the old one. The threading on the spindle at the tail end to take this sleeve and lock-nut is 32 t.p.i. and one can adjust the headstock spindle to give velvet-smooth running with this fine thread.

After this initial instance all went well, and as I am not used to this type of turning I handed over the lathe to one of my watchmaker friends for test, as a result of which we were very satisfied.

The machine would of course look better if made from proper castings and the addition of a small compound slide rest would be very helpful, together with various tailstock fitments.

The photograph at the head of this article was taken by J. Leonard Waller of Somercotes.

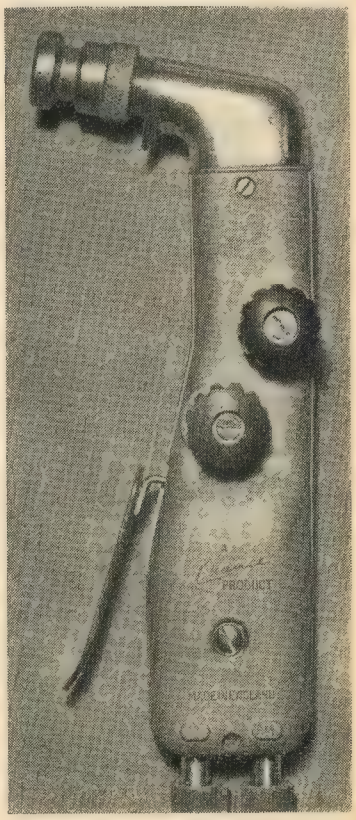
THE FLAMEMASTER BRAZING TORCH

THIS device is already well known to many of our readers, having been on the market about seven years. It was originally developed primarily for use in glassworking, but has proved extremely useful for all purposes where a handy source of intense heat is required, such as for brazing, tool hardening, gold and silver working, etc. The type previously available was designed to work only on coal gas, but a new model has now been introduced which works equally well on coal gas, butane, propane, methane or any other of the proprietary "bottled" fuel gases. This is done by the use of five interchangeable jets which can be supplied with the torch, enabling it to be readily adapted to the supply pressure and calorific quality of the gas being used.

In common with all other air/gas blowpipes, this torch requires a supply of air to ensure efficient combustion of the gas, the pressure required ranging from 3 to 5 lb. per sq. in. with the standard "Flexiflame" type of jet to 20 lb. per sq. in. for the new "Maxiflame" jet and nozzle assembly for specially intense heating. The air supply may most conveniently be obtained by means of a positive-displacement rotary blower of the Roots or vane type; fan blowers, unless of the multi-stage high-speed type are unsuitable except for the lower ranges of pressure, and reciprocating piston-type blowers need to be of large capacity to ensure adequate volume of output. Bottled compressed air, fed through a reducing valve, to obtain the appropriate pressure, can be used, and it is also possible to use oxygen in the same way.

The air/gas mixture ratio is controlled by two thumb-operated adjusting valves, and feed is maintained by a trigger grip, which when released cuts out the main flame, leaving a small pilot jet alight.

The accessories for the "Flamemaster" torch include a soldering bolt which can be fitted to the jet nozzle, a bench clamp for fixed work, "cross-fire" twin jets, an oxygen-air mixer and twin-bore feed pipes, in addition to the interchangeable jets mentioned above. This torch is manufactured by Chance Brothers Ltd., Lighthouse Works, Smethwick, and is obtainable from most tool dealers.



BORING IN THE LATHE

By "Scotia"

IN the selection of tools for a lathe job, it is true to say that this can be done by the experienced turner with the absolute minimum of trouble. This is a natural outcome of knowing what type of tool to look for, what it is capable of doing, and a fair idea of how it will perform.

However, it is only fair to say that such a tool as the writer has in mind isn't likely to be found in a turner's tool-chest. Let us say, rather, that it is more than probable that such a tool is "born" at the grindstone, being the result of inexperience.

It will be seen from the sketch, Fig. 1, that the leading edge of the boring tool, for such it is, has been ground away at much too acute an angle. Let it be said at this stage, that we are concerned only with the profile of the tool as seen in the plan view sketch, and it may be assumed that the necessary rake and clearances are correct, otherwise.

Fig. 1A. An incorrectly ground boring tool

Fig. 1B. Showing the insecurity of its performance

To use such a tool on anything other than the lightest of cuts is asking for trouble. Let us assume that a cut of say $\frac{1}{16}$ in. a side is being made with this tool in use. The fact that there may be no back-lash present in the lathe-saddle is no guarantee that the tool will perform correctly. There is every chance that during the course of the cut, the leading edge of the tool may become dull, and in the increased resistance set up towards the cutting of the material, it will almost certainly hesitate, and following that moment of hesitancy is almost sure to dive point first into the side of the material. Any tendency of the tool to evade cutting in the usual way will at one and the same time form a barrier opposing the leading edge of the tool, forcing the tool into disaster. The same conditions will arise when surfacing or sliding work in the lathe, when tools of similar faults are used.

The risk of using such tools is much increased when back-lash is present, as the shape of the tool lends itself to taking the least line of resistance, and there is every probability that it will charge the work, with disastrous results.

All this may appear to be of a very elementary nature, especially to those of us who are experienced in lathe-work, but one must never lose sight of the fact, that there is a first time for everything in lathe-work, and indeed a first time for everyone.

The sketch, Fig. 2, shows a boring tool of correct shape in use. It will be noted that the trailing edge of the tool has a distinct clearance from the work. There is a tendency among those of little experience, to have little or no clearance on the trailing edge of a boring tool, resulting in much squealing and oscillation.

In this connection, the tool used for boring should be distinct from the recessing type of tool, as the latter has a straight or square edge for the purpose of forming a recess.

Regarding rate of feed, many breakages are due to the eagerness of the worker, in his zest for the job in hand, to overwork the tool. One should always give the tool time to cut; if it is decided to use the lathe feed, a good plan is to select a feed just a little less than one would be inclined to use when hand-feeding the work. In this way, a reasonable margin of safety is allowed for all contingencies, such as tool breakage, work shifting in the chuck, etc.

In conclusion, it may be of interest to remark on the behaviour of a boring tool which has become (through old age or otherwise) rather too small in the head, generally. This type of tool, which quite often may still have a strong "neck" to support it, has an unpleasant habit, when cutting hard materials, of throwing metal cuttings up into the operator's face without warning.

In observations made during its performance, this phenomenon may be explained by the fact that the tool, being small in the head, appears to dip in a series of tiny movements, while at the same time removing chips from the bore. The "neck" or body of the tool is constantly reverting to its original position, and the net result is that the chips are catapulted upwards in a most disconcerting manner.

This is much in evidence when a fairly large hole is in course of being tooled out, and consideration should be given to replacing such a tool at the earliest moment, either by the use of a boring bar and tool-bit, or another boring tool of heavier duty, if only for the purpose of working in safety and comfort.

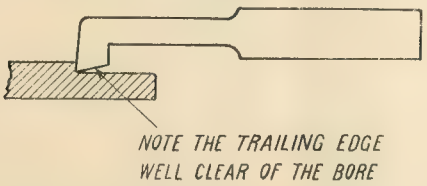


Fig. 2. Correctly ground boring tool

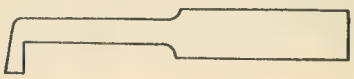


Fig. 3. Recessing tool—To use this for boring, it should be set slightly askew

Internal Lapping of Bearings

By "Duplex

ON several occasions in the past we have stressed the advantages of lapping the mating surfaces of rotating and sliding cylindrical bearings and, we would add, very satisfactory results can be obtained with quite simple equipment and with but little expenditure of time and energy.

When machining and fitting the bearings of a spindle, such as those of a drilling machine, many workers prefer to finish the outer bearing first and then to fit the spindle to it. One reason for this is, perhaps, that it is usually much easier to apply the micrometer to a shaft, to check the diameter and parallelism, than it is to measure a bore in the same way, and one has only to compare the ordinary outside micrometer with the elaborate instruments used for checking cylinder bores to see the force of this. Moreover, where a shaft requires correction, this can be carried out without difficulty. For these reasons it will be as well to begin by describing internal lapping and the appliances commonly used in the small workshop. Although turning and boring in the lathe give a finish sufficiently accurate for many purposes, this is hardly adequate for machine spindles and their bearings, where extremely close working-fits are required and long bearing life is essential. In this connection, it is accepted that the ordinary lathe will turn parallel only within certain recognised limits of accuracy, and a lathe will not necessarily machine a part truly circular unless the headstock bearings are in perfect order.

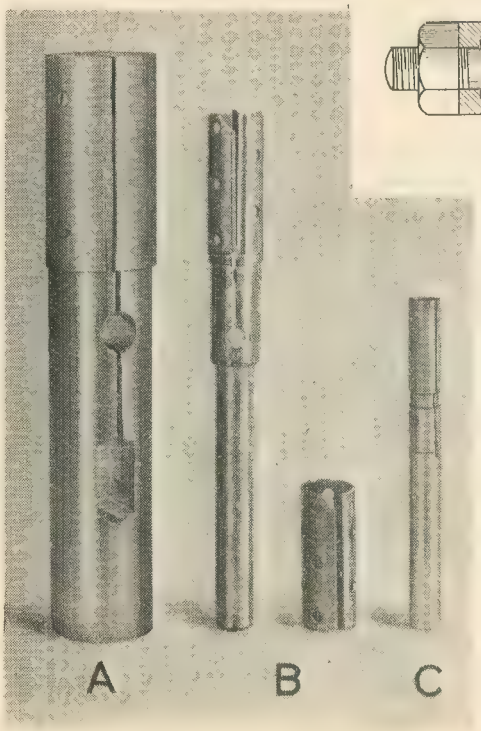


Fig. 2. A—a 1¼ in. diameter lap with copper sleeve; B—a Boyar-Schultz lap and spare sleeve; C—a ⅜ in. expanding lap

Internal Laps

Wooden laps, split at the end and fitted with a wedge to take up wear, are useful for polishing bores, but as the wood is compressible it is not so easy to work to the same degree of accuracy as is obtained with metal laps. Lead laps are rather easily deformed, but in the earlier days of the .22 bore rifle and target pistol we used to find that the shooting could often be greatly improved by lapping the rifled bore with a lead lap; this polished the bore and removed any tight places where metallic lead from the bullets was liable to collect. For this purpose a brass rod, well nicked at the end was inserted in the bore and molten lead was poured in to form a lap of about one inch in length.

Hand-lapping was then carried out, using the fine-grain abrasive made by Oakeys for cleaning table knives on a leather-covered knife board.

The typical form of internal lap, which is, perhaps, nearly as old as the process, is that illustrated in Fig. 1. Here an internally-coned sleeve slides on an arbor with a corresponding male taper. The sleeve is split, either in one plane for the full length or with several saw-cuts extending for some distance only from either end; the latter plan allows the sleeve to expand more uniformly when it is forced along the arbor by means of the adjusting nut. The arbor is made of mild-steel, and it is important, when making laps of this kind, to ensure that the arbor and sleeve are machined to the same degree of taper. Cast-iron is the material generally used for making the sleeve, but copper is equally suitable.

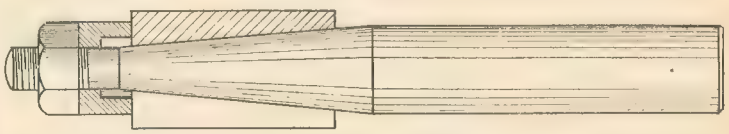


Fig. 1. An internal expanding lap

One advantage of this form of lap is that, to obtain a greater overall diameter, either a larger sleeve can be used or an additional sleeve can be fitted over the existing part.

For many years past, we have used a simple type of expanding, internal lap of the pattern illustrated in Fig. 2C.

The tubular sleeve is made either from a short length of copper tube, or a strip of sheet material is first formed roughly to shape and then finished to size by being forced through a hole bored to the nominal diameter. After the arbor has been turned to fit the sleeve, it is slit lengthwise, and an expander screw is fitted to provide a means of adjustment.

A more elaborate form of this lap, manufactured by Messrs. Boyar-Schultz in America, is obtainable in this country, and is an excellent tool, we find. One of the smaller sizes of these laps, together with a spare sleeve, is illustrated in Fig. 2B.

The fenestrated copper sleeve is formed with a tongue that engages in

the slit cut in the arbor, and so prevents rotation; the usual form of set-screw is fitted for expanding the arbor.

As shown in Fig. 3, in the larger sizes of laps of this make. the arbor is tapered and splined to fit the internal, die-cast sleeve on which is mounted an external sleeve of the same pattern as in the foregoing example. As the arbor is fitted with both an Allen pressure-screw and a locking ring, it is an easy matter to adjust the diameter of the outer sleeve with great exactness. We have been given a set of these tools, and in the workshop we find that they are easy to use and give accurate results, both when fitting bearings and when finishing the bores of small engine cylinders.

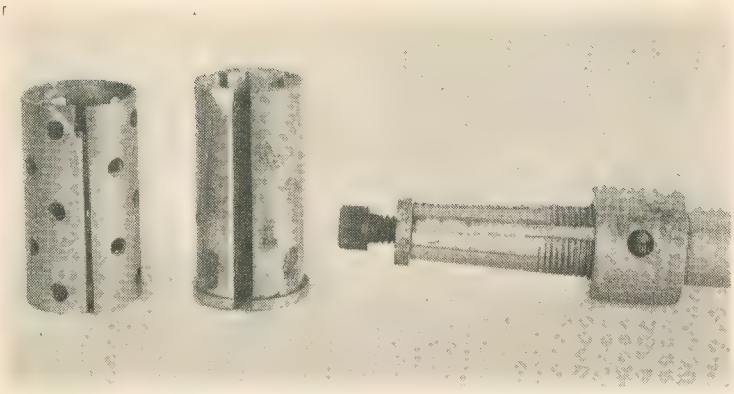


Fig. 3. Showing constructional details of a Boyar-Schultz 1 in. lap

Making an Internal Lap

However, we were recently faced with having to lap some machine bearing bushes having a bore of 1¼ in. and, as no lap of this size was available, it was decided to make one for the purpose.

The nearest size of copper tube obtainable from the plumber had an internal diameter of 1¼ in. and was of 16-gauge.

First, the arbor was made from a length of 1¼ in. diameter mild-steel rod, and the end portion for mounting the sleeve was reduced in diameter to 1.120 in. The shank was then cross-drilled and slotted and, after the arbor had been slit lengthwise, the four screws shown in the drawings were fitted.

Next, to allow the sleeve to be contracted to the nominal diameter, ¼ in. of the circumference was cut away by taking two lengthwise cuts with a hacksaw. The Allen grub-screw was now removed from the arbor, and the cap-screw tightened to draw the slit together. After the sleeve had been put on the arbor, the assembly was forced through a part bored 1¼ in. in diameter in order to close the sleeve to the nominal size. By turning the two adjusting-screws fitted to the arbor, the outside diameter of the sleeve can be varied and, at the same time, parallelism is maintained. The grub-screw should be set first, and the 2-B.A. Allen closing-screw afterwards tightened. The two brass keep-screws serve to hold the sleeve in place, and keep it from rotating on the arbor.

Lapping Compounds

The wide range of lapping compounds manufactured by the Carborundum Co., and described in a small brochure they issue, includes those most useful for the general run of work undertaken in the small workshop. The carborundum preparations are the quickest cutting, and should be used for lapping hardened steel parts. Grit sizes range from 60 to 700 and the finest grain abrasive will impart a high finish to the work. However, the extremely hard carborundum grains are liable to become embedded in softer metals and it is, therefore, safer to use the abrasives of the *K* and *H* series when lapping mild-steel, for a bearing that has become charged with abrasive will continue to act as a lap under working conditions.

Nevertheless, we have had cast-iron and steel bearings, lapped solely with carborundum compounds, running for thirty years without showing material signs of wear.

The 2*A* series of lapping compounds do not actually abrade the work surface and are mostly used to obtain a polished finish.

Preparation of the Work

As lapping is at best but a slow process, it is advisable to leave a minimum of surplus metal for removal in this way, and the work should in the first place be machined as accurately as possible, and with a good surface finish; reaming a bore before lapping will correct lack of parallelism and will also remove surface irregularities. Chatter marks should always be avoided at all costs, by machining with a sharp tool, having only a small area of contact with the work, for the removal of irregularities of this kind will entail much needless work with the lap, and may result in making the bore oversize.

For internal lapping, the work may have to be bored 1-thou. in. undersize; but if the machining is accurate, a ½-thou. in. should be sufficient.

The Lapping Operation

When lapping a bush in the lathe, it is usually best to grip the lap in the chuck and hold the work in the hand, for this keeps the lapping compound away from the chuck mechanism. Heavy parts are, however, difficult to handle in this way and there is then the danger of lapping the bore bell-mouthed or out of line. For this kind of work, it is usually better to mount the lap

(*Continued on page 507*)

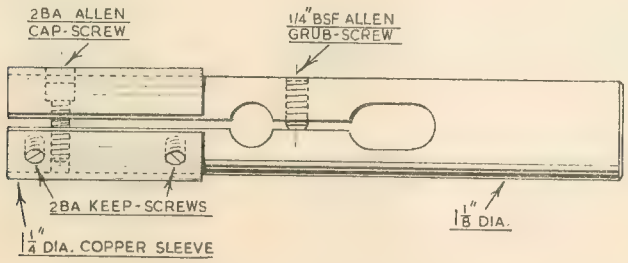


Fig. 4. The 1¼ in. lap made in the workshop

A ROTARY AIR COMPRESSOR PLANT

With Details of Oil Trap and Lubricator

By T. W. Attwater

SOME four years ago, I decided to install an "Alldays" ½-in. air-gas blowpipe as a more convenient source of heat than a 5-pint paraffin blowlamp.

As this called for a supply of compressed air, I bought from a MODEL ENGINEER advertiser an ex-A. M. "Turner" rotary-vane type of compressor, listed as delivering 7 cu. ft. of air per min., 10 lb. pressure at 1,200 r.p.m. At the same time I purchased an outboard bearing for the drive end of this machine. This consisted of an aluminium casting with a flange matching that on the compressor. This fitting is bronze bushed, and carries a hollow shaft, the inner end of which is splined internally to fit the driving spindle of compressor. The outer end of shaft is fitted with a bevel pinion, on to the boss of which I shrunk a steel sleeve 1⅜ in. outside diameter, to take a hose-pipe type of flexible coupling.

The mounting for compressor consists of a 6 in. length of 6 in. × 6 in. × ⅜ in. angle iron, flame-cut from a "Morrison" table shelter leg. I also had a 3 in. diameter hole flame-cut in one side of angle, this hole being finally bored out to suit the flange spigot on the outboard bearing.

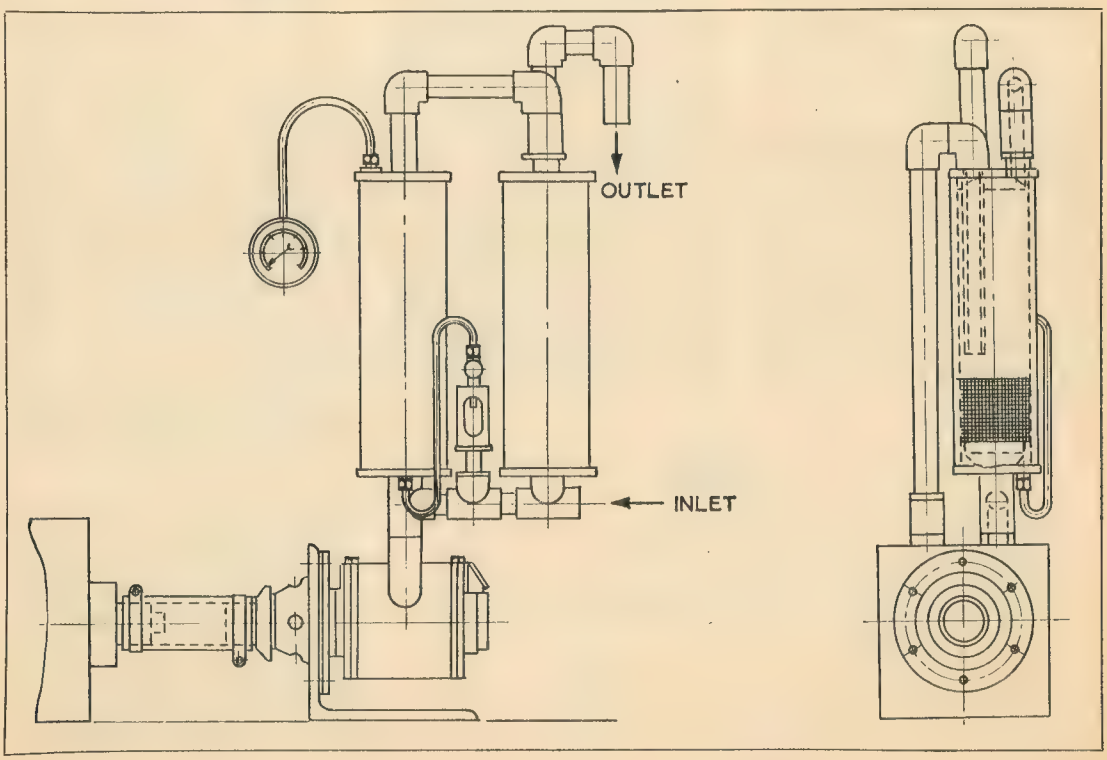
Four ⅜ in. holes for holding down bolts, and a ring of six ¼-in. holes to take bolts passing through flanges of compressor and outboard bearing, completed this part of the job.

I was already in possession of a 230 V, 1,450 r.p.m., ½ h.p., d.c. motor that had previously done duty on a petrol pump. This motor is fitted with a built-in d.p. switch for direct on-line starting. This, while no doubt quite satisfactory when driving the petrol pump, with a much geared-down V belt drive, proved much too heavy in starting current when direct-coupled to compressor. A d.c. starter for 1 h.p. motor was bought from a second-hand stall, for 5s., and bolted to the motor casing.

Connected in the armature circuit, and with the fly-back spring removed from contact-arm, this made a serviceable regulator.

A short length of 1⅜ in. diameter steel was bored and keyed to armature shaft and a 4 in. length of 1⅜ in. bore 3-ply hose secured by two Jubilee clips, completed the flexible coupling.

The motor and compressor were bolted to a short length of 3 in. × 9 in. deal, about a gill of engine oil poured into compressor and the motor started up. As was to be expected, the bulk of the oil was immediately blown out of the delivery port, and in about 5 min. the



5 amp fuses, in circuit with motor, melted out due to the compressor tightening up.

Clearly some system of constant lubrication and means of trapping the discharged oil were required.

I had, among other junk, two scrap tubes 10 in. long × 3 in. o.d. and four base-end plugs of some "Stokes" trench-mortar bombs, relics of the 1914-18 bother. These ends screwed into the internally threaded tubes making two excellent air receivers. I removed the ½ in. gas threaded spigots from two of the ends to form the tops. The spigots on the bases serving to mount the receivers on the outer two of the three ½-in. gas T-pieces, which, connected by two short lengths of tube formed the inlet pipe.

The centre T-piece was bushed to take a drip feed lubricator, the feed of which was connected to the base of No. 1 receiver.

Steel adapters, tapped ½ in. gas, were fitted to the inlet and discharge ports of compressor and the inlet pipe receivers and lubricator fitted to the inlet port.

A connection made from ½-in. gas tube and fittings was made from the discharge port to the top of No. 1 receiver and extended downward inside for 6 in. to ensure (I hoped) that the oil would collect in the bottom and not be carried over into No. 2 receiver.

Another connection was made between the top of No. 1 and No. 2, being carried down 6 in. inside as in No. 1. The final discharge from No. 2 was made from ½-in. gas fittings and a suitable adapter to take the rubber air tube to blowpipe.

A pressure gauge reading to 10 lb. and a relief valve set to lift at 6 lb., were fitted to the top of No. 1.

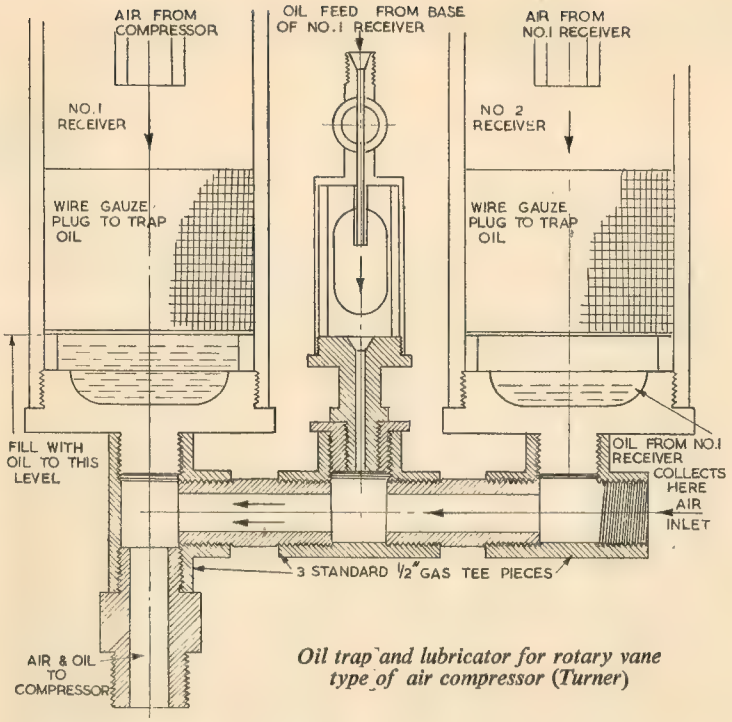
Oil to a depth of 1 in. was poured into No. 1, the motor started up, and lubricator set to a fast drip. For some minutes all went well, and then a fine intermittent spray of oil was blown from delivery pipe. Things were not going according to plan.

To remedy this trouble, I rolled up from long 2 in. wide strips of coarse mesh wire gauze, two plugs, to fit tightly into receivers. Each of these plugs was supported by a disc of perforated zinc, a ½ in. wide packing ring being interposed between disc and base-plug to give more room for oil. This seems to have solved the trouble, no visible sign of oil being present in the air delivered.

After a few hours run, a very small amount of oil collects in the base of No. 2 from which it is removed by drain tap.

The outfit has now been in use for over three years, and I find that with 5 lb. p.s.i. air pressure I can easily obtain enough heat to harden H.S.S. lathe and shaper tools (Armstrong-Whitworth A.W. brand). This requires the cutting edge to be raised to a dazzling white heat. The tool is then placed in the full air blast from blowpipe (with gas shut off) until cool.

Should any reader be in the Brighton district, I shall be very pleased to show the plant in operation.


AIR FROM COMPRESSOR
OIL FEED FROM BASE OF NO.1 RECEIVER
AIR FROM NO.1 RECEIVER
NO.1 RECEIVER
NO 2 RECEIVER
WIRE GAUZE PLUG TO TRAP OIL
WIRE GAUZE PLUG TO TRAP OIL
FILL WITH OIL TO THIS LEVEL
OIL FROM NO.1 RECEIVER COLLECTS HERE
AIR INLET
3 STANDARD ½" GAS TEE PIECES
AIR & OIL TO COMPRESSOR

Oil trap and lubricator for rotary vane type of air compressor (Turner)

INTERNAL LAPPING OF BEARINGS

(*Continued from page 505*)

in the drilling machine, so that the bore stands vertically. A very small quantity of lapping compound is next applied evenly to the lap, and the lap is adjusted until it will enter the work without difficulty. Forcing the work on to the stationary or revolving lap will tend to crush the abrasive grains and to embed them in the work surface.

The lap should be run at a moderate speed, and the work is kept moving up and down the lap; if the work is allowed to remain stationary, ringing of the surface may result.

From time to time, the work is removed for inspection, and both it and the lap are cleaned with paraffin to remove the worn abrasive and detached metal particles. The lap should be kept adjusted, in order to maintain light contact with the bore, and lapping is continued until all tool marks have been removed; if the mating shaft is to be lapped to size later, the exact diameter of the bore is of little importance. At the final stage, the work and the lap are carefully cleaned, and a fine-grain abrasive is used to give a polished surface; in this way, we have found no difficulty in giving bearing bushes what amounts to almost a mirror finish. After completion of the lapping, it is most important to remove all traces of abrasive by successive cleanings with paraffin and, after the assembled bearing has been at work for a short time, the parts should be dismantled and again thoroughly cleaned before fresh oil is applied.

READERS' LETTERS

● **Letters of general interest on all subjects relating to model engineering are welcomed. A nom-de-plume may be used if desired, but the name and address of the sender must accompany the letter. The Managing Editor does not accept responsibility for the views expressed by correspondents.**

STEEL BOILERS

DEAR SIR,—I was very interested to see in a recent issue (February 11th), the question of steel boilers being raised, both by "L.B.S.C." and a correspondent. As a matter of fact I have tried, without success, for the last three years, to obtain suitable copper plate for a locomotive I am building.

The proposed boiler is rather large, being 9 in. diameter and 3 ft. 4 in. long overall, this being for a 1½-in. scale South African Railway Pacific type engine. The under-frames, cylinders and motion work were completed and assembled two years ago and tested on air. Since then, while waiting for something to turn up, I constructed the tender.

I am now again where I was two years ago, viz.: trying to obtain copper for the boiler. It seems to me, therefore, that I should now seriously consider the use of steel, and I am wondering, therefore, if there are any more correspondents who could give us the benefit of their experiences in the construction and use of steel.

I would be particularly interested to know whether anyone has considered the use of a steel boiler with a copper firebox. This form of construction was fairly common in full-size practice in South Africa some years ago. This arrangement seems to offer a possible solution, as the copper firebox and tubes would not lessen the conductivity of heat to the water, the outer shell, being steel, would be much cheaper and also lessen the weight considerably. The only point of contact between the inner box and outer shell would be at the foundation ring and at the front tube plate.

I am quite aware of different rates of expansion between the two metals, but these seem to have been used with success in full-size practice. If I attempt the above, I propose using $\frac{3}{16}$ in. thick outer steel shell and ends welded, and a copper firebox of $\frac{1}{8}$ in. plate and the usual copper flue-tubes. The foundation ring I suppose would have to be riveted to allow a little movement, and might cause a little trouble in service. The tubes in front tube plate would probably be expanded, as suggested by Mr. Burdett.

I should be grateful for the views of others as to any snags they may foresee.

Yours faithfully,
Cape Town, S.A. W. SCHUTZ.

A JAPANESE MODEL

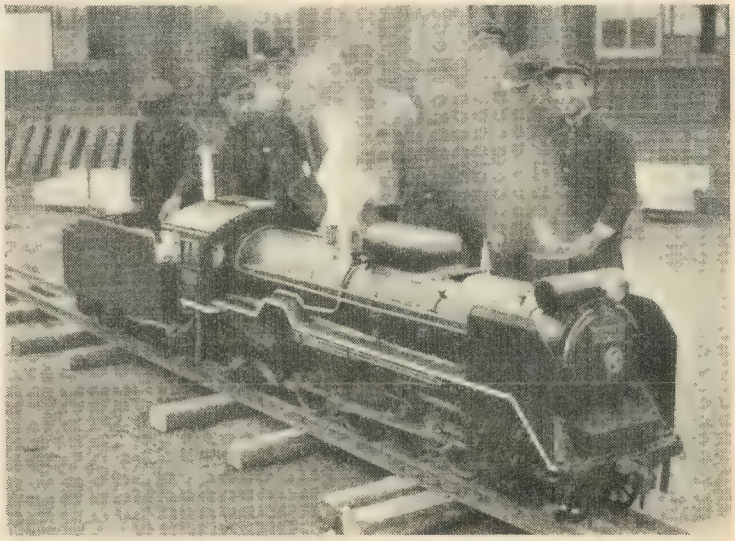
DEAR SIR,—I am a regular reader of THE MODEL ENGINEER since last year. To me it is the most interesting journal and I am waiting impatiently for next issue, which reaches me just two months after it is published.

Small locomotives, as well as real ones, entertained me most. I like the British locomotives most, which are quite neat looking. I have been attempting to build small locomotive since my school days, but chiefly owing to the lack of proper drawings I have not ever completed one. Now, thanks to THE MODEL ENGINEER, I know that you stock "real" working drawings.

I am sorry that now I cannot remit even 2½d. privately, but if you favourably send me a Plans Catalogue of small locomotives, I shall be quite happy.

The photograph shows a one-fifth full-size "D.51" series locomotive which was built by apprentice of Koriyama Works of the Japanese Goverment Railways. Boys behind the engine are pupils of The Tavia Technical High School, of which I am a teacher. They are also keen locomotive lovers.

Yours faithfully,
Fukushima-ken, Japan.
RYOICHI KUSANO.



THERE IS ALWAYS SOMETHING

DEAR SIR,—I fully endorse "L.B.S.C." in his article "The Eternal Question" (THE MODEL ENGINEER, March 25th) that the lack of equipment should not deter the chap who has the urge to do something—instead of dreaming about what could be done with a fully-equipped workshop, my own case being an example.

Late in 1952, upon promotion, I was transferred to this part of the country, and it became necessary to put all my household effects and my equipment into store. You can imagine my feelings to see my cherished lathe being packed away; however, to cut a long story short, to kill boredom I simply *had* to find something to do and decided that

the ½-seconds pendulum clock by Mr. C. R. Jones would be something to attempt. I am very pleased to say that, apart from the case, and fully completing the dial, this project has turned out remarkably well and is a source of pleasure to my family; they consider it, to mention their words, "Much more useful than my model engines." It is a very good timekeeper and fascinating to watch in movement.

As for the tools used in its construction, these were mainly purchased from the local multiple store, such as a drill brace, drills, rule, small files, etc., B.A. taps and dies being borrowed from friends. No machine tool was used in the construction of the clock except the drilling centrally of the worm, this being done by my friend Allen Hanky of Manchester, who is also making the case; he is a first-class joiner, whereas I am not so good at woodwork. The dial, as mentioned, has yet to be fully completed and plated; all the wheelwork was cut by hand, the contrate or count wheel fabricated, and the worm is the thread portion of a ½-in. Whitworth bolt. All this work was done on the drawing-room table, the 2-in. vice being mounted upon a piece of plywood.

The friend mentioned having given me a set of castings for the *Bat*, an "O"-gauge 4-4-0, this will be the next job, and I have already cut out the main and tender frames and made the tender body, this being a "bit o' polished brass" that our old friend E. W. Fraser likes so much. These pieces decorate the shelves in the drawing-room, keeping company with my 1½-in. scale traction engine, a 2½-in. gauge 0-4-4 L.B.S.C.R. tank engine and a nearly-completed 3½-in. gauge *Bantam Cock*, quite a museum!

In my hurry in packing up, some parts of the B.C. were put in store, also a half-completed 2½-in. gauge Stirling Single, although I have the Stirling boiler and driving wheels here; and when I think of all the equipment I own being packed away, I feel a little despondent at times.

However, if anyone feels as I do at times, he should have a go at *something*, and make the best of his time. Instead of day-dreaming, collect a few odd tools and "have a bash," follow "L.B.S.C.'s" advice and nobody will go wrong.

Yours faithfully,
Bideford. J. DAVIES.

WEBB'S "WATER BRAKE"

DEAR SIR,—It does appear to be the case, that the "water brake" mentioned by Mr. Willoughby was an attempt to find a cheap and simple continuous brake system, but the "snags" were so serious that the idea never got beyond one engine.

In 1876, the problem of handling the faster trains safely was acute; any engine could be fitted with a steam brake, and there would have been no object in confining a hydraulic brake to the engine only.

But better things were on the way; the Westinghouse and the vacuum systems, and it appears in the pages of *Railway Carriages and Wagons*, by S. Stone, (about 1910) that Webb designed his own version of the vacuum system. To dispense with a fluid was essential; imagine what would happen if one had a water cylinder left undrained in the winter, if an engine were laid by for a short time, and a "cold spell" developed. It is doubtful if a good "anti-freeze" compound could have been bought in 1876, and the railway directors would not have been keen on buying it if heavy expense would have been entailed.

Further, a hydraulic brake would only have been of service on trains of which the carriages were all coupled permanently, leaving only one joint to be made or broken, between locomotive and carriages, but air bubbles would inevitably have got into the system from only one joint, and then the braking power would have been enormously reduced. Indeed, a few moments thought must show why the scheme could not be developed into anything useful, and I cannot imagine why it was tried, unless someone with no knowledge at all of hydraulic matters had forced it upon the engineer and his designing staff, compelling them to stage a demonstration. Of course, there are plenty of hydraulic brakes and actuating cylinders in use today; some open and close doors of furnaces in places that are too hot for man to work in; others operate the "wing flaps" of aircraft, etc., but in any application of hydraulic power there must be no risk of freezing, and (excepting only to absorb the impulses in the column of water from a pump) no contact with air, or steam, as "L.B.S.C." has so often pointed out in connection with feed pumps.

The book I have mentioned shows detailed drawings of the general practice of vehicle construction and brake-work on railways at the time of publication, splendid examples of draughtsmanship will be seen, together with descriptions and sections of the vacuum and Westinghouse systems; the difficulties of using hydraulic power for railway braking are very apparent in the drawings.

Modern hydraulic appliances operate with "oils" or "anti-freeze" liquids compounded by specialist firms, and systems using them are arranged to avoid loss by leakage, and, of course, with special valves at the highest point to get rid of trapped air. But when air was itself made to do the actual work, as it was when the modern braking systems were invented, then the Webb hydraulic experiment was terminated forthwith.

Yours faithfully,
London, N.W. H. H. NICHOLLS.

MODEL POWER BOAT PONDS

DEAR SIR,—Congratulations to "Meridian" for compiling such a grand list of Power Boating Facilities that are available in different parts of the country.

Unfortunately, there evidently exists quite a number of clubs, who have the members interested in power boating, but have not the facilities for running.

The Maghull (Lancs) Club, which is on the outskirts of Liverpool, are in this predicament, and have to travel to neighbouring centres where the water is available.

My fellow club enthusiasts and I, notice that the lake at Newsham Park, Liverpool, seems to have no club attached, and are wondering if there are any enthusiastic power boat men in Liverpool who would care to "get together" with a view to forming a club for the Liverpool area.

If interested readers would contact me, I would endeavour to call a meeting with the formation of a power boat club in view.

Yours faithfully,
67, Norfolk Road, J. W. JONES.
Maghull, Lancs.

FOWLER PLOUGHING ENGINES

DEAR SIR,—Those of your readers interested in ploughing engines may like to know of a pair of Fowler ploughing engines which I saw recently near Bishops Stortford, Herts. They were *Lion* and *Tiger* (No. 15363) owned by John Patten, Steam Plough Works, Bishops Stortford. A plate on *Tiger* had the name John Patten, Hall Farm, Little Hadham, Herts. The engines were on a country road under their own steam, evidently having just completed ploughing.

Yours faithfully,
Watford. D. W. B. CARNAGHAN.

QUERIES AND REPLIES

"THE M.E." FREE ADVICE SERVICE. Queries from readers on matters connected with model engineering are replied to by post as promptly as possible. If considered of general interest the query and reply may also be published on this page. The following rules must, however, be complied with:

(1) Queries must be of a practical nature on subjects within the scope of this journal.
(2) Only queries which admit of a reasonably brief reply can be dealt with.
(3) Queries should not be sent under the same cover as any other communication.
(4) Queries involving the buying, selling, or valuation of models or equipment, or hypothetical queries such as examination questions, cannot be answered.
(5) A stamped addressed envelope must accompany each query.
(6) Envelopes must be marked "Query" and be addressed to THE MODEL ENGINEER, 19-20, Noel Street, London, W.1.

Joining Vee-Belts

Is it possible to join ½-in. × $\frac{5}{16}$-in. Vee-belts? I have access to several lengths of Vee-belting which is in perfectly good condition, except that it has been burnt through by friction in one place. The individual lengths are much longer than I need for my purpose and could be utilised if they could be cut and joined.

A.C.D. (Ballymoney).

It is very difficult to join this particular type of Vee-belting satisfactorily, and the manufacturers of this belting do not recommend attempting it.

It might be possible to join the belt by means of a link fastener of the type that was formerly used on motor-cycle belts; in any case, the joint would always be a source of weakness.

Multiple-Speed Lathe Drive

I have obtained an old screw-cutting lathe previously powered by treadle and wish to convert this to motor drive. I would like to arrange the pulley sizes so as to obtain six direct mandrel speeds. The 3-step pulleys on the lathe are for flat belting, and I do not wish to alter this. Can you give me some idea of the size of pulleys required. The diameters of the 3-step pulleys are 2¾ in., 4¼ in. and 5¾ in.

C.J.G. (Wisborough Green).

The best system would be to use a primary drive from the motor to a countershaft, having a cone pulley which is a replica in step dimensions of the pulley on the lathe mandrel, but arranged in reverse order.

The primary drive from the motor to countershaft may be arranged with 2-step pulleys giving reduction ratios of approximately 3½ to 1 and 4½ to 1 respectively. This could be arranged by using in the first case a 2½ in. diameter motor pulley driving on a 7½ in. diameter countershaft pulley, and in the second case, a 2-in. diameter motor pulley driving a 9-in. countershaft pulley. These ratios will give you a range of six speeds from approximately 150 to 950 r.p.m., assuming that the motor speed is from 1,425 r.p.m. to 1,450 r.p.m. The figures given are only approximate, as apart from variation of motor speed, a certain amount of belt slip must be allowed for.

We suggest that pulleys suitable for the primary drives could be obtained from the following firms: S. Tyzack & Son Ltd., 341-345, Old Street, London, E.C.1. E. Gray & Son Ltd., 3, Clerkenwell Road, London, E.C.1. Buck & Ryan Ltd., 310-312, Euston Road, London, N.W.1.

You may possibly, however, have to have the 3-step counter-shaft pulley specially made. However, a wooden pulley would be quite satisfactory, assuming that you wish to maintain flat belt drive.

Coloured Fillings for Engraving

In the issue of THE MODEL ENGINEER *dated March 12th, 1953 your contributor "Duplex" mentions a wax preparation specially made for filling the lines and figures on machine indices and other engraved parts. Please inform me where I can obtain small quantities of this wax.*

D.A.C. (Osterley).

The wax preparation made specially for filling engraved lines and figures may be obtained from Messrs. Taylor Hobson Ltd., Leicester.

The wax bears the trade name "Kwikfyl" and is used in the following manner: First, remove any lubricant that may have been used in engraving. As the wax is used warm, the work should be warmed also, and the "Kwikfyl" applied to the engraving with a heavy spatula heated in a smokeless flame. Be sure that the flame is smokeless, for a smoky flame will discolour the wax and spoil the work. When quite cold, rub the work down with a single thickness of lint-free cloth that has been stretched tightly over a flat cork or wooden block, and lightly moistened with paraffin or, preferably, with the liquid known as "Turps substitute." The engraving should finally be cleaned with a soft rag damped with clean water.

Banjo Unions

With reference to the article by "Duplex" on the fittings for the supply of cutting oil to lathe published recently in THE MODEL ENGINEER, *will you please inform me where I can purchase the necessary banjo unions employed in the components.*

D.F.C. (London, S.W.4).

If you are unable to obtain the type of carburettor union specified from your local suppliers, we would advise getting in touch directly with Messrs. Solex Ltd., 223-231, Marylebone Road, N.W.1., who will no doubt be able to supply you.

Alternatively, there would be no difficulty in removing the threads from the type of union you can obtain locally if the parts were mounted on a stub mandrel held in the lathe chuck. In this way, the treads can be turned off, leaving the work well finished. Care must be taken, however, to see that sufficient metal is left to allow the union to be drilled, if need be, to take the feed pipes.

Slow Speed Motor for Lathe

Would it be practicable to drive a Myford ML7 lathe with a 1/3 h.p. motor having a final shaft speed of 350 r.p.m. by either of the following methods:

(a) Fitting a pulley to the motor, the same size as the lathe countershaft motor, or

(b) Fitting equal size pulleys of similar diameter. This, of course, assumes a countershaft speed of 350 r.p.m. being suitable for this purpose.

E.F.C. (Didcot).

We take it that the speed of 350 r.p.m. which you quote is the motor speed at the output shaft. If so, it will be quite in order to drive on to a lathe countershaft pulley by using pulleys of equal size on motor and countershaft.

The actual size of the pulleys is not highly important, but the larger the pulley diameter, the greater amount of torque that can be transmitted.

The speed of 350 r.p.m. is a little on the slow side according to modern practice, and, therefore, it would be quite practicable to use a somewhat smaller pulley on the countershaft than on the motor. Incidentally, it would be possible with this motor to eliminate the countershaft, by fitting a stepped pulley direct on the motor shaft, as the necessity for a countershaft on motorised lathes is caused by the difficulty of getting a suitable reduction of speed directly from the motor.

WITH THE CLUBS

Harlow and District M.E.S.

This society has recently been formed in the new town of Harlow, Essex. It caters for all interests, model railways, aircraft, live steam, ships, etc., membership being open to anyone interested, over 18 years of age, who is invited to communicate with the Hon. Secretary: F. J. AMBROSE, 159, Felmongers, Harlow, Essex.

Redditch & District M.E.S.

Our annual general meeting was held recently and opened with a silence as a mark of respect for our late chairman, Mr. Charles Cook, who has been closely connected with the society since its inception in 1950.

During the past twelve months our members have gained useful experience in the workshop and our lathe project has progressed steadily.

Our president has given to the society a set of castings for a vertical steam engine; the machining is to be carried out by a member and retained by that member on completion.

Hon. Secretary: C. J. HARRIS, 95, Feckenham Road, Redditch.

South London Model Engineering Society

May 16th is the date of this year's South London Radio Control Regatta, to be held at Brockwell Park, Herne Hill, S.E.24, the starting time is 11 a.m. Intending competitors are asked to send in their entries at least seven days in advance and only one boat per competitor will be allowed. The entrant must be a member of the Model Power Boat Association, and if his boat is fitted with an i.c. engine it must be effectively silenced. Competitors are here warned that motor vehicles are not allowed in the park. The programme is as follows:

Event 1. Round the buoys steering competition. (Steering control only to be used).

Event 2. Target Steering Competition. (Steering and engine control allowed, not reverse).

Event 3. Time and Reliability Trial. (All controls).

Event 4. Prototype Competition. The judges will award a prize in this event to the competitor whose craft, in their opinion, is nearest to prototype both in performance and detail.

Further particulars of this Regatta may be obtained from the Power Boat Secretary: L. CASSANET, 19, Leander Road, London, S.W.2, to whom entries must be sent.

Harrow & Wembley Society of Model Engineers

This Society has recently constructed a 52-in. model tanker with steam power plant as a joint effort. This model will be launched by Lt.-Commander J. H. Craine, R.N.R. (Ret'd) ("Jason"), at the West Harrow Recreation Ground, on Sunday May 23rd at 10.30 a.m. Slipways are being built and the fleet of the Section will "dress ship" alongside. Power trials will follow with other events of interest.

Hon. Secretary: K. D. CARTER, 21, Stanley Road, Northwood Hills, Middlesex.

The Bristol S.M. & E.E.

The following meetings will be held at The Folk House, College Green, Bristol, 1. at 7.30 p.m.

May 12th. Wednesday.—"Power Boat Night," when members of our power boat section will bring along their latest models and tell us of recent developments.

June 16th.—Wednesday.—"Free and Easy Night," please bring along those bits and pieces and tell us of some of the difficulties which had to be surmounted to produce them.

Hon. Secretary: W. E. ROUND, 14, Britannia Road, Kingswood, Bristol.

Birmingham Society of Model Engineers

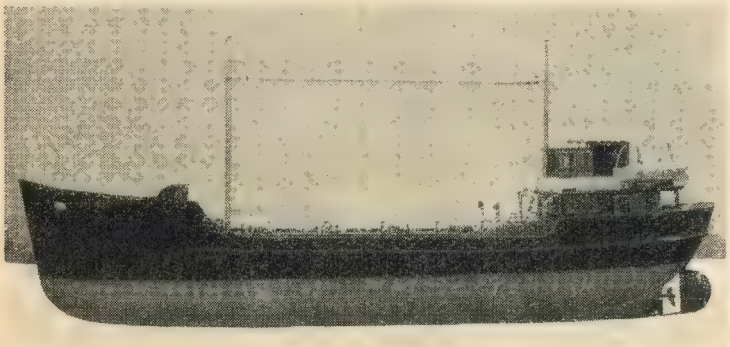
At the A.G.M. officers for 1954-55 were elected.

The society wishes to record its regret upon the retirement of Mr. W. H. Heaton from the presidency, due to ill-health. He had held the position with distinction continuously since the inception of the society 17 years ago. As a mark of respect for his unfailing service during this period, the society conferred hon. life membership upon him with best wishes upon his retirement.

The following programme has so far been fixed for the summer season:—

May 8th-9th, locomotive trials; May 22nd, Boy Scouts' day; June 5th, public day; June 6th-7th, visit to Romford for inter-club trials; June 12th, Lucas sports; June 19th-20th, visit from Harlington S.M.E.; June 26th-27th, national rally at Campbell Green; July 3rd, public day; July 10th, visit to Devils Bridge, V. of R. Railway; July 17th-18th, return visit from Romford Society for inter-club trials.

Hon. Secretary: J. E. GUY, 21, Kenwood Road, Bordesley Green East, Birmingham, 9.



The model tanker which will be launched in the pond at the West Harrow Recreation Ground at 10.30 a.m. on May 23rd

Colne and District M.E.S.

The winter session has seen great activity on our portable multigauge outdoor track which we hope to have operating (now the Corporation has granted permission) in Alkincoats Park, Colne. As we already have rights to use Brownhills Reservoir for boats, we are on the way to provide facilities for all types of modeller.

Hon. Secretary: W. WHITTAKER, 18, River Street, Colne.

The Brighouse S.M.E.E.

At the annual general meeting and the extra-ordinary meeting, held at the headquarters of the society, "Ravensprings Park," the following officers were elected to serve for the coming year: President, W. D. Miller; chairman, C. N. Sunderland; hon. secretary, G. Harrison, 98, Park View, Rastrick Common, Brighouse; hon. treasurer, J. L. Wood; publicity manager, E. Moore. committee, Messrs. H. Byram, H. Kitson, A. G. Bottomley, F. Mellor, G. Wood, D. Riddlesden and F. Birtwistle.

THE MODEL ENGINEER DIARY

May 15th and 16th.—Kodak Society of Experimental Engineers and Craftsmen.—Exhibition at Kodak Hall, Headstone Drive, Wealdstone. Saturday, 2 to 9 p.m. Sunday, 3 to 9 p.m.

May 16th.—South London Model Engineering Society. Regatta for radio controlled boats only, at Brockwell Park, London, S.E.

May 23rd.—Harrow and Wembley Society of Model Engineers. Launching of a 52-in. model tanker at the West Harrow Recreation Ground at 10.30 a.m.

June 26th and 27th.—Birmingham Society of Model Engineers. National Loco Rally at Campbell Green.

July 10th and 11th.—International Radio Controlled Models Society. Annual Contests for radio controlled models, to be held in Birmingham.—Model Boats on July 10th, and Model Aircraft on July 11th.

August 18th, 19th, 20th, 21st, 23rd, 24th, 25th, 26th, 27th and 28th.—THE MODEL ENGINEER Exhibition, at the New Horticultural Hall, Greycoat Street, Westminster, S.W.1. Open from 11 a.m. to 9 p.m.

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Buck & Ryan for Lathes and Accessories, drilling machines, grinders, electric tools, surface plates, etc.—310-312, Euston Road, London, N.W.1. Phone: Euston 4661.

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Two S/H Motorised 5" Lathes, complete with stands and in perfect condition. Sheldon, £75, and Logan, £55.—CAXTON ENGINEERING, 21, Winters Road, Long Ditton, Surrey, Emberbrook 1357.

Wanted. Small B.G.S.C. lathe, price, etc., to—10, The Knoll, Acomb, York.

E.W. 2½" Lathe, motor, chucks, £20. Buyer collects.—77, Clayton Road, Bradford.

Wanted. Foot Motor, suitable for "M.L.7" For disposal, 1/3 h.p. cap. start Hoover, 230 V, 1 phase, 50 cycs. Also Bullfinch gas torch, both brand new. Unused.—H. DIXON, 29, Lanethorpe Cres., Darlington.

Wanted. Small motorised lathe (single phase a.c.), preferably "M.L.7.," accessories not essential, offers. State price, condition and accessories if any.—BURDETT, 101, Oundle Road, Orton Longueville, Peterborough.

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Wanted. B.T.H. a.c. motor, type BA137, form D.A. 1½ h.p., revs. 1,425. Volts 230/250, 50 cycles, single phase.—BRINTONS LIMITED, Kidderminster.

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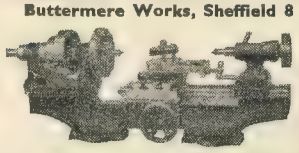

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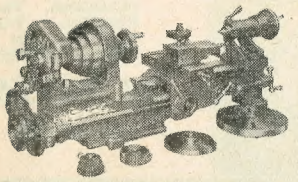

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D.C. Mains Motors, ¼ to 10 h.p., approx. 75 per cent. below list.—Below.

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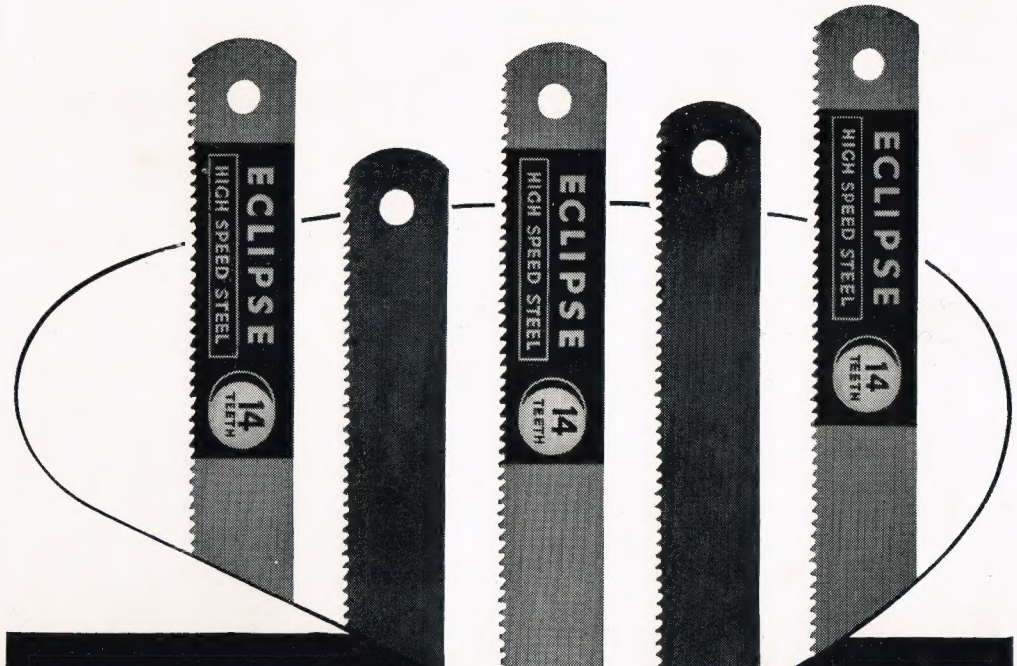

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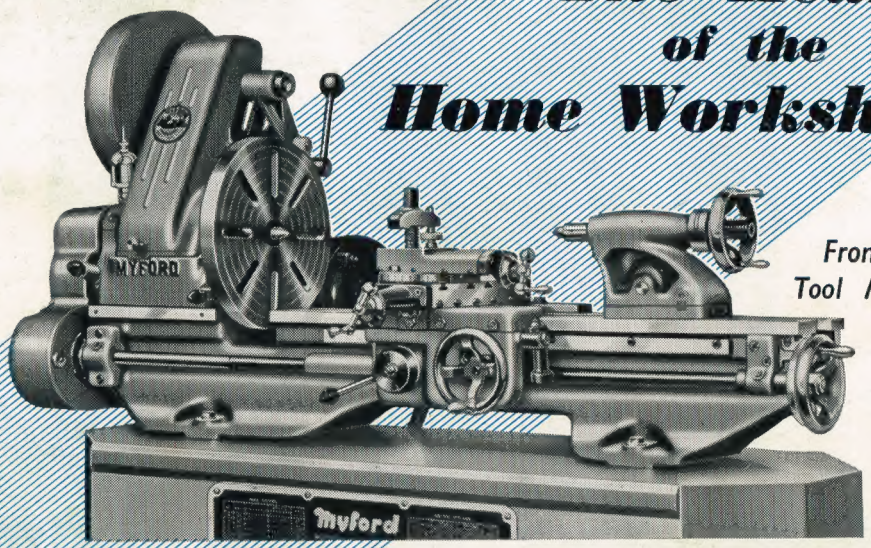

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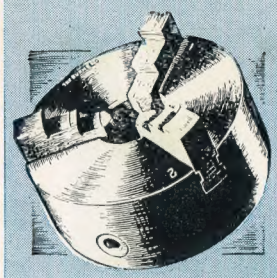

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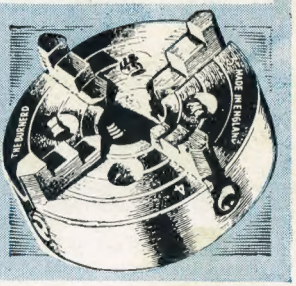

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